



Marywood

UNIVERSITY

MFI Technical Report 98-3

Physical Activity Patterns and Satisfaction with Fitness Facilities Among Military Members and Their Families

Lee Harrison
Mark Brennan
Cynthia M. Shilanskis

September 1998

MILITARY FAMILY INSTITUTE
MARYWOOD UNIVERSITY, SCRANTON, PA

199811030408



Approved for public release; distribution is unlimited.



Military Family Institute
Marywood University
2300 Adams Avenue
Scranton, PA 18509
HTTP://MFI.MARYWOOD.EDU
PHONE: (717) 961-4716

Michael D. Shaler, M.B.A.
Director

Alan M. Levine, Ph.D., R.D.
Deputy Director for Research

Joseph G. Giacofci, M.B.A.
Deputy Director for Administration

NOTICES

Acknowledgement of Sponsorship

"Effort sponsored by the Air Force Office of Scientific Research, Air Force Materiel Command, USAF, under grant number F49620-93-1-0586. The U.S. Government is authorized to reproduce and distribute reprints for Governmental purposes notwithstanding any copyright notation thereon."

Disclaimer

"The views and conclusions contained herein are those of the authors and should not be interpreted as necessarily representing the official policies or endorsements, either expressed or implied, of the Air Force Office of Scientific Research or the U.S. Government."

Foreword

Service in our Armed Forces is contingent upon the attainment and sustainment of a specified level of physical fitness. Additionally, there is a documented relationship between overall individual fitness and the military member's productivity. This relationship also extends to the fitness levels of the families of married military members.

The research described in this report was designed to further our understanding of the ways in which fitness levels are maintained throughout our Armed Forces. This study gathered data from all the military services and from members stationed both in the continental United States and overseas. The specific purpose of this study was to provide a solid baseline on physical activity levels, the availability of fitness facilities and incumbent fitness programs, and the preferences of both military members and family members.

The data presented by this study will enable policy makers to make informed decisions concerning future investments in improved fitness facilities and fitness programs. Additionally, envisioned improvements can be better targeted to serve specific target audiences. Throughout the report, a number of implications are provided which spring from analyses of the data; these are designed to assist the reader in navigating the wealth of data available in this study.



Michael D. Shaler
Director

Acknowledgements

The authors wish to express their appreciation to the many people who made this research possible, and especially to the following, all of whom greatly contributed to the success of the project.

First and foremost, we wish to thank Congressman Joseph M. McDade without whose vision the Military Family Institute (MFI) would not exist. We are also grateful to Ms. Carolyn H. Becraft, Deputy Assistant Secretary of Defense (Personnel Support, Families, and Education); Mrs. Gail H. McGinn, Principal Director (Personnel Support, Families and Education); Colonel Jack Padgett [Office of Community Support Policy], and Ms. Sally Entlich [Office of Community Support Policy] for their support in assuring us access and cooperation from the services.

Our sincere thanks to Vince Iannacchione, Jun Liu, Robert Bray and Randy Keesling, all of the Research Triangle Institute, for their enormous help in the sampling and analysis stages of this project. Thanks also go to Matthew Boehmer and Robert Hamilton, Defense Manpower Data Center, for preparation of the sampling data.

At the installation and service levels, we wish to express our sincere thanks to those Military Liaison Officers, points of contact, and installation support staff who provided outstanding support and coordination on installation. A total of 38 installations worldwide provided the MFI with extraordinary cooperation and effort in the conducting of this study. Their efforts are much appreciated.

At the Military Family Institute we are indebted to many colleagues who provided expertise and time to help us see this project through. These individuals include Michael D. Shaler, Colonel, U.S. Army (Retired), Joseph G. Giacofci, Lieutenant Colonel, U.S. Air Force (Retired), and Alan Levine, Ph. D., as well as:

Team Members: Carlton Bessinger, Ph.D., R.D., Associate Professor, Marywood University; Kristin Hillebrand, Doctoral Assistant; Denise Tomanek, Graduate Assistant.

MFI Staff: Jeffrey D. Leitzel, Research Associate; Judith Page, Editorial Assistant; Emily McGuire, Research Assistant; Brenda Lanning, Sandra Magera, Lisa Yager, and Rich Zaler Graduate Assistants.

Data Collection Team Members: Evelyn Albert, Renee Bessinger, William Dadek, Donna DaPolito, Michael Demko, Joe DeMuzzio, Elaine Friedman, Elizabeth Giacofci, Joanne Jurkiewicz, Judith Lyon, Peter Lyon, Mark Massen, Edward Murphy, E. Bud Poehlman, Barbara Senapedis, Marian J. Smith, Patrick Tomeo, John Wehrum and Dave Weidner.

Scientific Reviewers (and their affiliations): Maxine Thompson, Ph.D. (North Carolina State University) and Peter S. Jensen, M.D. (National Institute of Mental Health, MD).

Most important, we are deeply indebted to the nearly 20,000 military members, military spouses, and families who shared their feelings and opinions. Without them there would not have been a study.

About the Authors

Lee Harrison, Ph.D., RD, FADA, served as Principal Investigator for the *Physical Activity Patterns and Satisfaction with Fitness Facilities Among Military Members and Their Families* study. A registered dietitian with over 25 years of teaching experience on the graduate and undergraduate levels, Dr. Harrison is an Associate Professor of Nutrition and Dietetics and has served as co-chair of the Nutrition and Dietetics Department and Director of the Dietetic Internship Program at Marywood University. Prior to her work on this study, she was an Associate Researcher for the MFI study, The Health and Nutrition of Children in Military Families.

Mark A. Brennan, M.S., served as Research Associate on the *Physical Activity Patterns and Satisfaction with Fitness Facilities Among Military Members and Their Families* study at the MFI. Mr. Brennan received his B.S. in Sociology from Salisbury State University and his M.S. in Sociology from the Pennsylvania State University. He is an adjunct faculty member in the Social Science Department at Marywood University, teaching courses in research methods, sociology, and social problems.

Cynthia M. Shilanskis, M.A., served as Research Associate on the *Physical Activity Patterns and Satisfaction with Fitness Facilities Among Military Members and Their Families* study. Ms. Shilanskis served in the U.S. Air Force from 1977-1981. She received both her B.S. and M.A. in Experimental Psychology from the University of Texas at El Paso.

Executive Summary

Introduction

The *Physical Activity Patterns and Satisfaction with Fitness Facilities Among Military Members and Their Families* study was conducted by the Military Family Institute (MFI) at Marywood University. The purpose of the study was to obtain baseline data on the physical activity levels, preferences, and intensity of military members, their spouses, and their families. It also collected a variety of data related to satisfaction with fitness facilities and programs.

The study focused on the following research questions:

- In which physical activities do military members and their families engage and with what frequency and intensity?
- Where do military members and their families participate in these activities?
- What reasons do military members and families have for using on- and off-installation facilities?
- How do military members and their families rate on-installation facilities?
- What changes or improvements could be made to on-installation facilities to make them more appealing?
- What fitness programs are viewed as being most and least important to members and their families?
- How do members and their families view themselves as it pertains to their levels of physical activity and job performance?

Methodology

The methods used for data collection were based on a sampling process that drew a sample population from military installations throughout the United States and various overseas installations. A two-stage sampling design was utilized. The first stage consisted of a random selection of 38 installations from a population of 346 military installations worldwide with 500 or more active duty personnel. The second sample consisted of military members and their families and was stratified by gender, rank, duty location, and family status on these installations and at remote locations.

Ultimately, a total of 16,378 military members were selected. On average, between 300 and 600 members at each installation received questionnaires. Additionally, 3,132 questionnaires were mailed to "remotes." Finally, 14,845 military families were also surveyed. The same sampling criteria was used for military members, families, and remote personnel.

For on-installation data collection, questionnaires were administered in group settings to the selected military personnel. Participants were asked to hand-deliver family surveys contained in their packets. If the military member had children but no available spouse, the member was instructed to complete the survey for his or her family. The family survey packet included a postage paid return envelope for use by the respondent to mail the completed questionnaire back to the MFI. Return of a completed questionnaire was considered consent to participate. Selected Armed Forces personnel who were not able to attend on-site sessions received a member survey (and family survey when applicable) through the installation mail or U.S. Postal Service. The response rate in this study was 55% for individual military members and 32% for military families.

Frequency distributions, bivariate and univariate descriptive statistics were computed for the study content areas. This report summarizes the major findings for each area. Some of the totals for the descriptive statistics may not add up to 100% due to rounding and question formats (i.e., the ability to select more than one response option). Where possible, comparisons were made between military families and civilian populations.

Survey Results

This section describes the responses of selected military members, families, and military children within three content areas: Physical Activity Levels and Intensity, Physical Activity Preference and Location, and Satisfaction with Facilities. Each content area is summarized and implications are indicated.

Physical Activity Levels and Intensity

Military Members

- The majority of military members met health recommendations to exercise three times a week or more at moderate intensity or greater for at least 15 to 20 minutes.
- The highest frequency of exercise reported was by Army and Marine Corps members.
- More Air Force and Navy members reported exercising less than three times per week than did members of the other military services.
- Twenty-three percent of those who were not required to participate in mandatory PT (Physical Training) reported no exercise in the previous week. Only 7% of those who were required to perform PT reported not exercising in the last week.
- The majority of military members (88%) reported exercising at somewhat hard levels to very, very hard levels of exertion.
- The mean BMI score was 25.2 for military members. The new cutoff for being considered overweight is 25. Nearly 20% of the sample was found to be within the 25 to 26 BMI range.
- The top three reasons for exercising were for fitness, fun, and to manage weight.
- Approximately two-thirds of respondents reported that exercise helped their job performance.
- About half of the respondents thought that they exercised enough to stay healthy. Females were more likely than males to think they should exercise more.
- More than half of all Air Force respondents believed they should exercise more.
- Over one-third of military members reported that nothing would motivate them to increase their frequency of exercise.
- More military members reported exercising three or more times per week than did a comparable population of civilians.

- Fifteen percent of military members did not exercise at all in the preceding week. This was comparable to civilian data.

Implications

Continue current programs that promote physical activity and fitness among military members and their families.

Although most military members reported exercising at least three times per week for 15-20 minutes, over one-third did not. These people were more likely to be women, Air Force and Navy personnel, and those who were not required to perform mandatory PT. Programs targeted at these groups could be effective at increasing the exercise levels for military members as a whole.

Since the majority of military members are now considered overweight under the new BMI standards, DoD may wish to also use measures of body fatness to get a more accurate picture of the fitness of its members.

Since the top reasons for exercising were fitness, fun, and weight management programs designed to emphasize these aspects could be used to target specific populations and to increase participation.

Those who were required to participate in mandatory PT reported exercising at higher rates than did those who did not. In addition, it was suggested that time scheduled for exercise during the workday would help to increase exercise levels. Combinations of these two factors could help to provide military members with the time and motivation to participate more regularly in exercise programs, particularly as exercise was cited as greatly improving job performance by military members.

Military Spouses

- Less than half of military spouses exercised three times a week or more. However, this was substantially more exercise than done by a comparable group of civilians.
- The number of male and female spouses who did not exercise in the previous week was substantially higher than those for a comparable civilian group (14% and 21% respectively).
- Female spouses exercised less frequently than did male spouses.

- Army and Marine Corps spouses were more likely to exercise seven or more times a week.
- Air Force spouses were the most likely group to report no exercise in the previous week.
- Of those spouses that exercise, most (71%) reported exercising at somewhat hard levels to very, very hard levels of exertion.
- The mean BMI score for military spouses was 24.8. The new cutoff for being considered overweight is 25.
- Most military spouses were in the normal weight category. However, there were also more that were in the obese category as compared to military members
- Spousal reasons for exercise were to manage weight, for fitness, to improve appearance, and for fun. These reasons were the same as those given by military members, however, in somewhat different proportions.
- The majority of spouses indicated that exercise was beneficial to their job.
- Sixty-two percent of spouses thought that they should exercise more.
- To increase motivation to exercise, female spouses most often cited a need for childcare services. Male spouses most often wanted more competitive events. Both wanted more organized events.

Implications

Continue current programs that promote physical activity and fitness among military members and their families.

Since 12% of the spouses were categorized as obese, specialized programs could be developed to encourage fitness and weight reduction.

Organized and managed programs that emphasize weight management, stress management, and fitness could be developed and provided for spouses and military members.

On-site childcare could be made available at fitness centers.

Military Children

- As they got older, girls exercised less frequently than did boys.
- Most parents perceived their children to be as active or more active than other children their age. Most children participated in exercise outside of PE (Physical Education) class.
- Across all grades, most children participated in PE classes three times a week or more.
- In grades 5-12, the majority of children reportedly participated in PE class five or more times per week.

Implications

Additional programs for children designed to focus on individual and team sports as well as organized programs could be developed and targeted toward girls.

Physical Activity Preference and Location

Military Members

- The majority of military members both CONUS and OCONUS regularly used on-installation facilities.
- Reasons for using off-installation facilities included location, convenient hours, and more modern equipment.
- Military members were satisfied with the overall quality of fitness services.

Implications

Suggested improvements to increase use of on-installation facilities: more convenient hours of operation, additional work out space, greater variety and amount of equipment.

Military Spouses

- Spouses used on-installation facilities much less than did military members.
- Many female spouses were not aware of facilities and programs available on installation.
- Providing childcare was mentioned by both male and female spouses as an improvement that would increase on-installation participation.
- Spouses who did not use on-installation facilities cited as reasons: distance, lack of childcare, and overcrowding.

Implications

Suggestions to attract spouses to on-installation facilities included: increase childcare services, offer special programs for women, improve hours of operation, and make facilities more family oriented.

Development of special advertising directed at spouses, particularly female spouses, informing them of the services, programs, and equipment available could help increase spouse physical activity levels.

Military Children

- Children used on-installation facilities less often than did spouses or military members.
- Male children played more team sports as they became older. Girls tended to continue with individual aerobic activities such as: swimming, skating, bicycle riding, and dancing. These are aerobic activities suggested by the American Academy of Pediatrics (Surgeon General's Report, 1990).
- Basketball and soccer were very popular with male and female children of all grade levels.

Implications

Individual lifetime activities, which emphasize aerobic exercise (bicycling, swimming, tennis, and running), should be encouraged for girls and boys of all ages and supported by providing on-installation facilities.

On-installation physical activity participation could be increased by offering team sports (football, soccer, basketball, volleyball, and softball) for boys and girls of all ages.

Satisfaction with Facilities

Military Members

- Fitness centers, swimming pools, and gyms were the most valued facilities.
- Least valued facilities and programs were golf courses, sports above the intramural (IM) level, and bowling centers.
- All military members were less satisfied with the quality of facility personnel as compared to the quality of buildings, furnishings, and equipment.
- The majority of military members felt that their quality of life would moderately or greatly decrease if facilities were not available.

Implications

In-service programs or training to improve the quality of fitness facility staff could help to increase satisfaction with facilities by military members.

When considering new facilities, fitness centers, gymnasiums, and swimming pools could be given priority.

Fitness facilities were rated as being extremely beneficial to the military member's quality of life. Facilities should be expanded and made as state-of-the-art as possible.

Military Spouses

- Spouses were much less satisfied with the quality of on-installation facilities than military members.
- Fitness centers and swimming pools were chosen by both female and male spouses as the top two most valued facilities or programs.
- Females rated bowling centers and males rated gyms as the third most valued facility.
- Least valued programs and facilities were golf courses, sports above IM and skate paths.
- Spouses were much less satisfied with all aspects of fitness facilities and programs than were members.
- Spouses were much more likely to answer 'don't know/not sure' when asked to rate the quality of facilities and programs.

Implications

Installations could conduct individual satisfaction surveys of spouses to determine their levels of satisfaction and specific areas for improvement.

Installations could develop public relations campaigns and programs to inform spouses of the range and quality of facilities and programs available on installation.

Conclusion

This study identifies areas of strength and concerns related to physical activity levels, intensity, and satisfaction with fitness facilities and programs for military members, their spouses, and their children. The implications that conclude each content area address the issues that surfaced in the analysis and interpretation of the data. The technical report highlights a few key areas that provide direction for Department of Defense to target most valued activities and increase satisfaction.

Fitness is critical to the readiness of military members. These members can serve as valuable role models to spouses and children to increase their levels of fitness and health. Attention and improvements to facilities and programs mentioned in the report will allow military fitness facilities to become the standard for the fitness industry.

**Physical Activity Patterns and Satisfaction with Fitness Facilities
Among Military Members and Their Families**

Contents

1. Introduction	1
2. Research Questions	2
3. Methodology	
3A. Sampling Design and Installation/Military Member Selection.....	3
3B. Instrument Development	4
3C. Pretesting	5
3D. Headquarters and Installation Level Liaison Officers	5
3E. Research Teams.....	5
3F. Survey Packets and Tracking of Respondents	6
3G. Data Collection	6
3H. Follow-up Mailings	7
3I. Response Rates.....	8
3J. Data Analysis.....	8
3K. Weighting of Data	9
Subgroups for Analyses.....	10
Statistical Analyses.....	10
4. Results: Characteristics of the Sample	
4A. Demographics of Military Members.....	11
4B. Demographics of Spouses	13
4C. Demographics of Military Children.....	14
5. Physical Activity Frequency and Intensity	
5A. Military Members.....	15
Frequency of Exercise	15
Intensity of Exercise	19
Body Mass Index (BMI) Comparisons	21
Military Members.....	22
Military Member Frequency and Intensity by BMI.....	24
Reasons for Exercising.....	25
Perceptions of Personal Physical Activity Levels	27
Factors Which Would Increase Exercise.....	27
5B. Military Spouses	28
Frequency of Exercise	28
Intensity of Exercise	29
Body Mass Index (BMI) Comparisons	30
Military Spouse Frequency and Intensity by BMI.....	31
Reasons for Exercising.....	32
Perceptions of Personal Physical Activity Levels	33
Factors Which Would Increase Exercise.....	33

5C. Military Children.....	34
Frequency of Activity	34
Participation in Physical Activity Classes by Duty Location	35
5D. Discussion.....	35
Military Members	35
Military Spouses	37
Military Children.....	37
Intensity of Physical Activity	38
5E. Summary and Implications.....	40
Military Members	40
Military Spouses	42
Military Children.....	43
6. Physical Activity Preference and Location	
6A. Military Members	44
Favorite Activities	44
Where Members Exercise	45
Reasons for Not Using On-Installation Facilities	45
Reasons for Not Using Off-Installation Facilities	46
Reasons for Using Off-Installation Facilities.....	47
Suggested Improvements for On-Installation Facilities	48
6B. Military Spouses	50
Favorite Activities	50
Where Spouses Exercise	51
Reasons for Not Using On-Installation Facilities	52
Reasons for Not Using Off-Installation Facilities	52
Reasons for Using Off-Installation Facilities.....	53
Suggested Improvements for On-Installation Facilities	54
6C. Military Children.....	56
Activity Preferences	
Preschool	56
Grades K-4	56
Grades 5-8.....	57
Grades 9-12.....	58
Where Children Exercise	59
Grades K-4	59
Grades 5-8.....	60
Grades 9-12.....	61
6D. Discussion	62
Military Members	62
Military Spouses	62
Location	63
Military Children.....	64
6E. Summary and Implications	65
Military Members	65
Military Spouses	65
Military Children.....	66

7. Satisfaction with Facilities	
7A. Military Members	67
Satisfaction with On-Installation Physical Activity Facilities	67
Most Valued Facilities/Programs	71
Least Valued Facilities/Programs	71
Most Valued Facilities/Programs by Gender	71
Quality of Life Without On-installation Facilities	73
7B. Spouses	75
Satisfaction with On-Installation Physical Activity Facilities	75
Most Valued Facilities/Programs	78
Least Valued Facilities/Programs	78
Quality of Life Without On-Installation Facilities	79
7C. Discussion	81
7D. Summary and Implications	83
Military Members	83
Military Spouses	84
References	85
Appendix A: Sampling Design	A-1
Appendices B, C & D (published separately)	
B. Frequency Tables	
C. Cover Letters	
Military Member Physical Activity Survey	
Military Family Physical Activity Survey	
D. Data Collection Manual	
Military Liaison Officer's Manual	

1. Introduction

Physical fitness is considered to be a significant component of the general health and well being of all individuals. In 1995, the American College of Sports Medicine and the Centers for Disease Control and Prevention recommended that all Americans engage in at least 30 minutes of moderate-intensity physical activity on most, preferably all, days of the week. *Healthy People 2000* (1990) suggests that vigorous physical activity 3 days per week for at least 20 minutes promotes cardiovascular fitness.

The Department of Defense (DoD) has always emphasized the need to maintain high levels of fitness to ensure that personnel would be in condition to perform their military duties including being physically prepared for deployment. Recent quality of life surveys in the DoD indicate that accessibility to fitness facilities and programs is one of the top concerns of military members (Bray, Kroutil, Wheless, Marsden, Bailey, Fairbank, & Harford, 1995; *Healthy People 2000*, 1990).

Quality-of-life issues have a direct impact on the readiness and retention of military members and their families and, therefore, receive significant levels of appropriated fund resources. Of equal importance are the positive effects of fitness on maintaining good health and reducing the risk of dying from coronary heart disease, the leading cause of death in the United States (Surgeon General's Report, 1996). Physical activity also reduces the risk of developing diabetes, hypertension, and colon cancer; enhances mental health; fosters healthy muscles, bones, and joints; and helps maintain function and independence in older adults (Surgeon General's Report; *Healthy People 2000*, 1990).

Increasingly in the civilian sector, fitness facilities and many recreational activities are gaining popularity as a means to achieve and maintain physical strength, stamina, and flexibility. Fitness facilities, in particular, are expanding to include a variety of programs to meet the needs and preferences of a wide range of potential clients (Surgeon General's Report, 1996). Often, there are programs specific to women, children, and to the elderly. Some programs focus on stress reduction as well as on the connection between the mind and the body (i.e., martial arts training). Not only are physical and mental needs being addressed, but social networking is taking place among individuals with similar interests (Surgeon General's Report; *Healthy People 2000*, 1990). Diversity of available programs is being acknowledged as a means to hold the interest of clientele and provide opportunities for fitness and fun.

At present, many DoD installations offer military members, their families, and other authorized customers a variety of recreational programs and physical activities through installation fitness centers. This study examined which physical activities were performed by military members and their families, the level of exertion at which the activities were performed, and specific reasons for using both on- and off-installation facilities. The study also established the level of customer satisfaction of military members and their immediate families with both on- and nearby off-installation facilities.

The data will provide a benchmark against which to measure future improvements that will result from the DoD initiative *Operation Be Fit* which began in the spring of 1997. This initiative is designed to expand opportunities for military community members to achieve physical fitness and increase their participation in such activities.

The results of this research can be used by the DoD and the military services to develop policies, programs, and services related to member and family fitness opportunities.

2. Research Questions

This report addresses several research questions:

- In which physical activities do military members and their families engage and with what frequency and intensity?
- Where do military members and their families participate in these activities?
- What reasons do military members and families have for using on- and off-installation facilities?
- How do military members and their families rate on-installation facilities?
- What changes or improvements could be made to on-installation facilities to make them more appealing?
- What fitness programs are viewed as being most and least important to members and their families?
- How do members and their families view themselves as it pertains to their levels of physical activity and job performance?

Note: Tables further supporting the findings are located in Appendix B. Appendixes B, C, and D are published separately.

3. Methodology

3A. Sampling Design and Installation/Military Member Selection

The sample of military members and families was selected in two stages. Initially, First Stage Units (FSU) were identified by geographical region within each service. These were the actual military installations where personnel were stationed and ultimately surveyed. The sample was selected with probability proportional to size and with minimum replacement. This process was conducted by the Research Triangle Institute (RTI) using data from the Defense Manpower Data Center (DMDC) and Geocodes to identify installations and the home ports of Naval Afloat ships. A more detailed listing of the methods used in sampling this population can be found in Appendix A.

Each FSU selection was stratified by service and duty location (CONUS-Continental United States/ OCONUS - Outside Continental United States). A total population of 346 military installations with 500 or more active duty persons were identified. A random sample of FSUs were then taken, with 38 installations ultimately selected. A listing is found in Appendix A, Table A-1.

The second stage consisted of a random sample of individuals at each FSU. These were selected based on the following stratification criteria: service, rank, gender, duty location, and family status (whether the military member was single, married, or married with children). In addition to these individuals, other personnel located more than 25 miles outside of selected FSUs were selected and labeled as remote personnel.

Ultimately, a sample of 16,378 military members was selected. On average, between 300 and 600 military members at each installation received questionnaires. A total of 3,132 questionnaires were mailed to remotes. Finally, 14,845 military families were also surveyed. The same sampling criteria was used for military members, families, and remote personnel.

It should be noted that these total sample numbers are slightly less than those stated in the RTI report (Appendix A); this is due to a difference in the actual time frame in which personnel records were selected. As a result of delays in data collection, the sampling frame was applied to more recently updated DMDC personnel listing. The number of families chosen varied by installation, but on average was between 150 and 500 families.

3B. Instrument Development

The Military Member Questionnaire, designed by the Military Family Institute (MFI), contained 106 questions. Wherever possible, questions from existing instruments were used in order to make comparisons with non-military populations. These questions were adopted from several sources, including:

ARIC/Baecke Questionnaire of Habitual Physical Activity (Baecke, Burema & Fritjers, 1982)

MWR Triennial Needs Assessment 1996 Leisure Needs Survey
(U.S. Army Community and Family Support Center)

A Sample Questionnaire to Assess Physical Activity, Physiological Fitness, and Health (Paffenbarger, Blair, Lee & Hyde, 1993)

The Health and Nutrition of Children in Military Families (Levine & Dougherty, 1997)

The 1995 Department of Defense Survey of Health Related Behaviors Among Military Personnel (Bray, et al., 1995)

Marine Corps Quality of Life 1993 Member Questionnaire (Kerce, 1995)

The Family Member Questionnaire, also designed by the MFI, contained 117 questions and was completed by the spouse of a married military member. This questionnaire was similar to the member survey but was expanded to include information about a maximum of four physical activities performed by the spouses and children in the family. The family member questionnaire was designed using the same sources as the military member questionnaire, with additional questions taken from *The Health and Nutrition of Children in Military Families* survey (Levine & Dougherty, 1997). A copy of each questionnaire is presented in Appendix C.

3C. Pretesting

A pilot study was conducted at an Air Force base in the Midwest between August 23-27, 1997. A total of 433 military members were surveyed under conditions that would be encountered during the data collection phase of the study. The goal of the pretest was to identify problem areas and potential errors in the questionnaire and methodology prior to embarking on the full-scale project. Only minor changes were required in the questionnaire and procedures based on responses from the pretest.

3D. Headquarters and Installation Level Liaison Officers

Both a Headquarters Liaison Officer (HLO) and a Military Liaison Officer (MLO) were designated by the individual services to assist at the service branch and installation levels, respectively. The MLO was responsible for the day-to-day site preparation at the individual base. These liaisons assisted in generating support for the survey, notifying commands and personnel of their selection for inclusion in the study, coordinating scheduling of site visits and survey sessions, and contacting selected personnel to schedule a convenient time for participation.

Each MLO was supplied with a detailed manual containing step-by-step instructions for organizing survey sessions and related activities. Copies of these manuals can be found in Appendix D. They were also supplied with materials describing and supporting the project and a listing of selected personnel. To promote ease of use, personnel listings were provided in a variety of formats including hard copies (printouts sorted alphabetically and by unit) and computer disks.

3E. Research Teams

Eleven two-member teams were assembled for data collection. Training was held at the MFI during September 3-4, 1997, and included instruction in data collection procedures, survey administration, database management, and laptop computer operations. Team members were also provided with a detailed data collection manual containing instructions for the field (Appendix D).

In order to develop a working relationship between the team and the MLO, and to generate support and commitment for the project, research team members made weekly telephone contact with their respective MLOs during the 6 weeks prior to arrival at the installation. This helped to ensure that problem areas were identified and corrected prior to the team's arrival for data collection.

3F. Survey Packets and Tracking of Respondents

Survey packets were assembled prior to entering the field. Military member packets included a member questionnaire, a cover letter from Dr. Lee Harrison (Principal Investigator), and a letter of support from Carolyn Becroft (Deputy Assistant Secretary of Defense, Office of Personnel Support, Families and Education). Family survey packets were placed inside the packets of married members. Each of these contained a family member questionnaire, two corresponding cover letters, and a postage-paid return envelope (Dillman, 1978). A serial number for tracking purposes was printed on each questionnaire. These numbers were recorded prior to shipping the materials to the field for on-site distribution or direct mailing through the U.S. Postal Service. These were used to monitor and record receipt of questionnaires at MFI. Copies of all cover letters and questionnaires can be found in Appendix C.

3G. Data Collection

The MLO appointed by the commander at each base/post was contacted by a MFI research associate for determination of survey dates, times, and mailing addresses. Six weeks prior to the scheduled installation visit, a survey guideline manual was mailed, detailing the data collection responsibilities of the MLO. Approximately 1 week after mailing the manual a second phone contact with the MLO confirmed receipt of the manual, and introduced the MFI field team who would be conducting the survey.

The MLO was contacted at least weekly prior to the date of the survey to confirm logistical arrangements such as survey sites, session scheduling, and inter- and intra-service coordination. Regular contact provided the opportunity for survey teams and MLOs to discuss any problems or concerns they might encounter. Four to five weeks prior to the scheduled survey sessions, personnel lists of the selected military members to be surveyed were mailed to each installation's MLO. This provided ample time to notify personnel and schedule survey sessions.

At least 2 weeks prior to the scheduled date, questionnaires were mailed to the installation. A telephone call confirmed their receipt. One week prior to leaving for the designated installations, MFI data collection teams finalized logistics with their MLOs.

During pre-scheduled sessions, the questionnaires were administered in-group settings to the selected military personnel (the maximum number per group was 50). The majority of participants took between 30 to 60 minutes to complete the questionnaire (see Appendix D for standardized instructions for the questionnaire administration). Participants were asked to hand-deliver family surveys contained in their packets. If the military member had children but no available spouse, the member was instructed to complete the survey for his or her family. The family survey packet included a postage-paid return envelope for use by the respondent to mail the completed questionnaire back to the MFI. Return of a completed questionnaire was considered consent to participate.

To increase family member response rates, a reminder postcard was mailed to each family. This postcard informed the spouse of a five-dollar gift certificate incentive in return for his or her participation and asked the family member to contact the MFI with any questions or concerns regarding the survey.

Following the survey session, completed questionnaires were collected and returned to the MFI for data analysis. Selected members who were not able to attend on-site sessions received a member survey (and family survey when applicable) through the installation mail or U.S. Postal Service.

3H. Follow-up Mailings

To enhance the response rate, two additional mailings were sent to the selected members and families who had not responded (Dillman, 1978). Three weeks following the distribution of the original questionnaire, a follow-up reminder letter and an additional questionnaire were mailed to each non-respondent (both member and family). After 6 weeks of non-response, this process was repeated. As questionnaires were returned, MFI files were updated to reflect participation. Family members who completed a survey received a five-dollar gift certificate to their service exchange. At the end of data collection, all information linking respondents to completed questionnaires was deleted from MFI records.

3I. Response Rates

The response rate for individual military members in this study was 55% and 32% for military families (Table 3-1). Response rates varied somewhat from those in similar studies, due to several reasons: the selection of installations scheduled for decommissioning, last minute changes of MLO at installations, and unplanned major deployments associated with Bosnia and the Persian Gulf operations.

Table 3-1
Survey Response Rates

	Number sampled	Unable to participate*	Number available	Number completed	Response rate
Members	19510	4114	15396	8528	55%
Spouses	14845	4072	10773	3493	32%

* Members or spouses who were unable to participate as a result of being retired, permanently changed station (PCS), deceased, or assigned to a new installation. Personnel were also unable to participate if there was not a usable home or unit address to be used for mailings.

By service, the highest response rate (70%) was reported in the Air Force (Table 3-2). This was followed by the Army (52%) and the Marine Corps and Navy (both with 50%). It should also be noted that the total number of military members varies slightly from the total sample population. This is due to several military members (eight cases) not being identified with a branch of the Armed Forces.

Table 3-2
Military Member Response Rate by Service

Service	Number Sampled	Unable to Participate	Number Available	Number Completed	Response Rate
Air Force	4492	743	3749	2613	70%
Army	5216	1255	3961	2061	52%
Marine Corps	4461	847	3614	1796	50%
Navy	5333	1261	4072	2058	50%

3J. Data Analysis

Data from the surveys was collected in scannable booklets. These were scanned with an NCS OpScan 5 Optical Mark Reader (NCS: Columbia, PA). The data was cleaned with respect to out-of-range values and blatant response inconsistencies. The cleaning of data involved the elimination of data in these areas. The Statistical Package for the Social Sciences (SPSS) version 8.0 was utilized for data storage, management, and analyses.

3K. Weighting of Data

Due to the variation across services and groups in terms of response rates, the project team applied weights to the data to make the final analysis more closely representative of the population as a whole.

Weighting has basically two functions. The first is to adjust for known deviations from the sample design (e.g., unequal sampling fractions, varying response rates across various subpopulations). Adjusting for unequal sampling fractions simply involves taking inverses of the sampling fractions. Varying response rates are calculated for subclasses using variables that are available for both respondents and nonrespondents. The second function of weighting is to adjust for unknown sources of bias. This basically involves comparing the sample distributions with known population distributions and making adjustment so the two coincide.

The data calculation of weights for analysis was a fairly straightforward process. The sampling weights were provided by RTI. Their calculation is described in detail in Appendix A. FSU, gender, family status, and rank are the variables that were used to divide the sample and respondents into strata. RTI provided sampling weights for each of these strata. Response weights were then calculated for each FSU by gender, family status, and rank strata.

These weights were calculated by dividing the number of individuals in the sample by the number of respondents within each stratum. The resulting response weights were then multiplied by the corresponding sampling weights. These weights adjust for differences in both sampling and response probability. The weights calculated in this manner differed in magnitude by a factor of over 1,500 between the smallest and largest weights. This indicated a very wide range of variability in terms of probability of participation in this survey at the individual level.

It was decided to constrain the weights so that the smallest and largest would vary by no more than a factor of 50. This constraint strikes a reasonable balance between the competing goals of wanting the data to be as representative as possible and not wanting to allow a small number of possibly atypical individuals from having an excessive influence upon the results. This resulted in the smallest 4.4% of weights being increased and the largest 4.0% of the weights being decreased. The weights were then scaled so that they equaled the actual sample size so that statistics calculated would reflect accurate numbers of respondents.

Weights for spouses were calculated very similarly, except that for the response weights, respondents could not be identified with a specific FSU with certainty. Response weights were calculated for strata defined by service, gender, family status, and pay grade. These response weights were multiplied by the sampling weights provided by RTI and then constrained and scaled as described above for the member weights.

Subgroups for Analyses

Study content areas were analyzed by the following subgroups of respondents:

Military Members

- Service [Army, Navy, Marine Corps, and Air Force]
- Duty Location [Continental U.S. (CONUS) or Overseas (OCONUS)]
- Gender [Male and Female]
- Rank [Officers and Enlisted]

Spouses

- Service [Army, Navy, Marine Corps, and Air Force]
- Gender [Male and Female]

Children

- Gender [Male and Female]
- Academic Grade [Preschool, Grades K-4, Grades 5-8, and Teenagers (Grades 9-12)]

Statistical Analyses

Frequency distributions, bivariate and univariate descriptive statistics were computed for the study content areas. This report summarizes the major findings for each area. Some of the totals for the descriptive statistics may not total 100% due to rounding and question formats (i.e., the ability to select more than one response option). Where possible, comparisons were made between military families and civilian populations.

4. Results: Characteristics of the Sample

4A. Demographics of Military Members

Most military members were male (82%), enlisted (82%), stationed at CONUS installations (82%), and married with children (42%). The population was primarily young, with 65% between the ages of 21 and 35. Six percent were younger than 20 years of age, and 29% were over the age of 35. No appreciable differences were found in age between the male and female members. The majority (74%) of respondents had a high school diploma, some college credits, or both.

Enlisted personnel were further separated into junior enlisted (31%) and senior enlisted (51%). Junior enlisted were classified as pay grade E-4 or lower; senior enlisted were E-5 through E-9.

Officers represented 18% of the sample. They were separated into junior officers representing 11% and senior officers representing 7%. Junior officers contained all warrant grades through O-3, and senior officers were designated by grades O-5 or higher.

Overall, 39% of military members lived on installation/ship; 61% lived off installation. Over half (55%) of the members surveyed lived in privately owned or rented/leased housing. Approximately 22% lived in military family housing on installation, 6% lived in military housing off installation, and 15% lived in barracks located on installation. The only noticeable difference for OCONUS was that a higher number of members (55%) lived in military family housing.

When compared with the *Profile of the Military Community: 1997 Demographics* (Military Family Resource Center, 1997), the respondents were similar in all aspects to the most recent DoD population estimates (Table 4-1). The percentage of respondents in each service was also similar to that reported in this report.

Table 4-1
Overall Demographics of Military Members

	n	%		n	%
Duty Location			Gender		
CONUS	4772	82%	Male	5943	82%
OCONUS	1047	18%	Female	1326	18%
Service			Family Status		
Army	2411	28%	Married with children	3491	42%
Navy	2329	27%	Married without children	1721	21%
Marine Corps	1126	14%	All others	3024	37%
Air Force	2649	31%			
Education					
Age			No HS diploma or GED	147	2%
20 years or younger	487	6%	HS diploma	1821	22%
21-25 years	2042	24%	1-4 years of college - No degree	4419	52%
26-30 years	1723	20%	Baccalaureate degree	845	10%
31-35 years	1770	21%	Advanced degree	1146	14%
36-40 years	1457	17%			
41-45 years	694	8%			
46-50 years	242	3%	Pay Grade		
Over 50 years	60	1%	Enlisted	6820	82%
			Officer	1416	18%
Overall Living Location					
Barracks/dorm	1,278	15%	Pay Grade Breakdown		
Aboard ship	161	2%	Junior enlisted	2600	31%
Military family housing on installation	1,889	22%	Senior enlisted	4360	51%
Military family housing off installation	500	6%	Junior officer	914	11%
Privately owned/rented/leased housing	4,673	55%	Senior officer	634	7%

4B. Demographics of Spouses

The majority of military spouses were female (70%), lived in the continental United States (80%), were between the ages of 21 and 35 (61%), and had a high school diploma or some college education less than a four-year degree (69%). Seventy-one percent of the spouses were employed outside of the home. By service affiliation, 27% of the spouses were in Army families, 29% Navy, 11% Marine Corps, and 33% Air Force (Table 4-2).

Table 4-2
Overall Demographics of Military Spouses

	n	%		n	%
Gender					
Male	858	30%	CONUS	2589	80%
Female	2034	70%	OCONUS	662	20%
Age					
20 years or younger	88	2%	Army	947	27%
21-25 years	521	14%	Navy	1,001	29%
26-30 years	818	22%	Marine Corps	377	11%
31-35 years	892	25%	Air Force	1,168	33%
36-40 years	697	19%			
41-45 years	420	12%	Family Service Status		
46-50 years	132	4%	Less than 12 years of school (no diploma)	69	2%
Over 50 years	68	2%	GED or other high school equivalency certificate	69	2%
			High school diploma	646	18%
			Less than 2 years of college credits, but no college degree	1091	30%
Work Location			2 year college degree	346	10%
Do not work outside the home	1083	29%	More than 2 years of college credits, but no college degree	389	11%
Work outside the home	2693	71%	4-year college degree	534	14%
			Some graduate school, but no graduate degree	184	5%
			Masters, doctoral, or professional school degree	287	8%

4C. Demographics of Military Children

The majority of military children were in fourth grade or below (Table 4-3). Male and female children were equally represented in the preschool and grades 5-8 ranges. More male children than female were reported in the K-4 and Teenager groups. There were no differences in gender distribution between grade school and teenage children among the services (Tables 4-3 to 4-4 in Appendix B).

Table 4-3
Overall Demographics of Military Children

	Male		Female					
Preschool Children Ages	n	%	n	%		Family Service	n	%
My preschool child is age 0-1	206	29%	206	29%		Army	1018	27%
My preschool child is age 2-3	295	40%	298	43%		Navy	1079	29%
My preschool child is age 4-5	208	29%	177	25%		Marine Corps	383	11%
My preschool child is age 6 or older	12	2%	18	3%		Air Force	1243	33%
Children by Grade by Gender	n	%	n	%				
My child is in Kindergarten	129	10%	128	11%				
My child is in Grade 1	120	8%	106	9%				
My child is in Grade 2	136	10%	96	8%				
My child is in Grade 3	106	8%	70	7%				
My child is in Grade 4	133	10%	99	9%				
My child is in Grade 5	128	10%	104	9%				
My child is in Grade 6	110	8%	117	10%				
My child is in Grade 7	74	6%	126	11%				
My child is in Grade 8	99	7%	61	5%				
My child Is In Grade 9	84	6%	95	8%				
My child Is In Grade 10	84	6%	63	6%				
My child Is In Grade 11	74	6%	33	3%				
My child is in Grade 12	65	5%	41	4%				

5. Physical Activity Frequency and Intensity

5A. Military Members

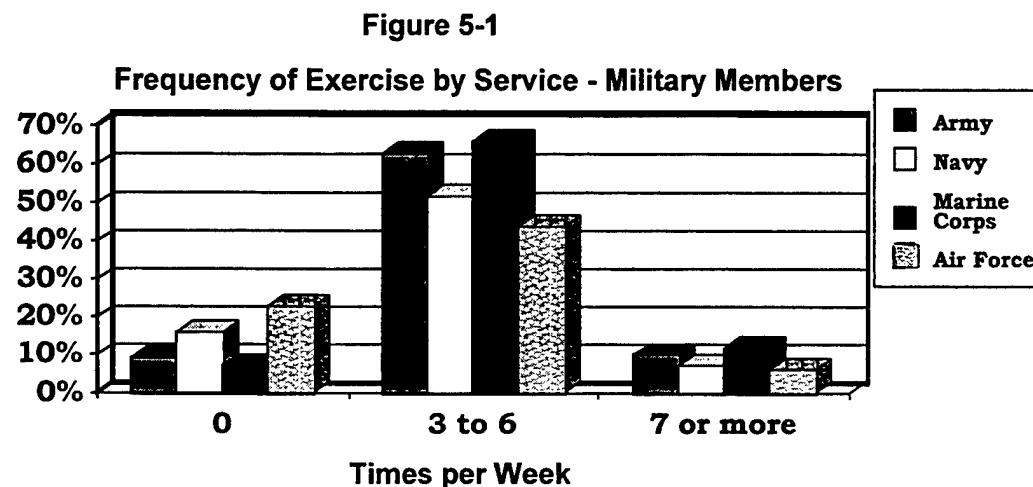
Frequency of Exercise

Military members were asked the number of times they had exercised (for between 15 and 20 minutes) at moderate levels during the past 7 days. This was compared to their perceived intensity. *Healthy People 2000* and various DoD reports suggest that individuals exercise three times per week for 20 minutes or more at moderate to hard levels of exertion (Army Personnel Survey Office, U.S. Army Research Institute, 1995; Bray, et al., 1995). Sixty-four percent of military members met these recommendations (Table 5-1). However, 15% did not exercise at all, and 37% exercised less than three times per week.

Table 5-1
Overall Frequency of Activity
of Military Members

Number of times	n	%
0	1279	15%
1	721	8%
2	1214	14%
3	1971	23%
4	1248	15%
5	1048	12%
6	394	5%
7	220	3%
More than 7	476	5%

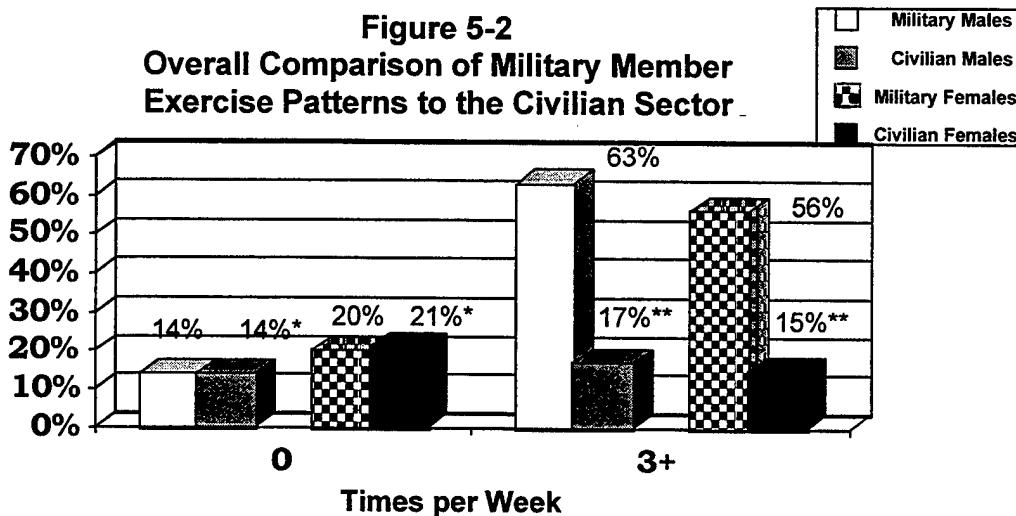
Over 70% of Army and Marine Corps personnel exercised three or more times per week, while fewer than 10% reported no exercise in the previous week (Figure 5-1). Navy and Air Force respondents were most likely to report having no exercise over the past 7 days (16% and 23% respectively). In general, male military members exercised more often than did their female counterparts (64% vs. 56%). There were no differences in this data based on duty location or rank (Tables 5-1 to 5-5 in Appendix B).



When compared to civilian data (Surgeon General's Report, 1996; Healthy People 2000, 1990), both male and female military members reported exercising three or more times per week at a higher percentage than did a comparable group of civilians (Figure 5-2). The percentage of military members who did not exercise in the last week was comparable to the civilian data.

Specifically, during the week prior to completing the questionnaire, four times as many Marine Corps and Army personnel reported exercising three or more times per week than did a comparable group of civilians. Air Force and Navy personnel were three times more likely to exercise three or more times per week than were civilians. Navy military members had a rate of inactivity similar to civilian data, while Air Force personnel had a higher rate of inactivity compared to civilians.

Figure 5-2
Overall Comparison of Military Member Exercise Patterns to the Civilian Sector



* Source: NHANES III (1988-1991)

** Source: NHIS (1991)

The military is somewhat unique in that it often requires members to perform physical activity on a regular basis. Fifty-three percent of military members reported participation in mandatory physical training as a job requirement. Physical training (PT) most often consists of organized, scheduled and often supervised calisthenics, running, or other physical activities. Twenty-three percent of those who were not required to participate in mandatory PT reported no exercise in the previous week. Only 7% of those who were required to perform PT reported not exercising in the last week.

A higher percentage of enlisted personnel (57%) reported participating in mandatory PT than did officers (38%). The majority of both officers and enlisted personnel in the Army and Marine Corps participated in mandatory PT (Table 5-2). In the Navy, the majority of enlisted personnel (64%) reported participation, while slightly more officers (51%) reported not being required to perform PT. In the Air Force, 11% of enlisted personnel and 7% of the officers reported being required to perform mandatory PT.

Table 5-2
Military Member Participation in Mandatory PT
by Service by Rank

Service	PT Participation	Enlisted		Officer	
		n	%	n	%
Army	No	255	14%	229	48%
	Yes	1,521	86%	250	52%
Navy	No	706	36%	167	51%
	Yes	1,243	64%	159	49%
Marine Corps	No	122	13%	36	29%
	Yes	797	87%	88	71%
Air Force	No	1,806	89%	420	93%
	Yes	227	11%	33	7%

Required PT was most commonly performed three times per week (45%). Those military members not required to perform PT were the most likely not to have exercised in the last week (23%). The number of times that PT was performed per week was consistent across service, gender, rank, and duty location (Tables 5-6 to 5-10 in Appendix B).

Demographics were identified that could be used to provide a profile of those who did not exercise and those who exercised very often.

**Which military personnel were most likely to report
NOT exercising?**

- Air Force members (48%)
- Married members with children (47%)
- Military members between the ages of 21 and 35 (67%)
- Military members not required to participate in mandatory PT (23%)

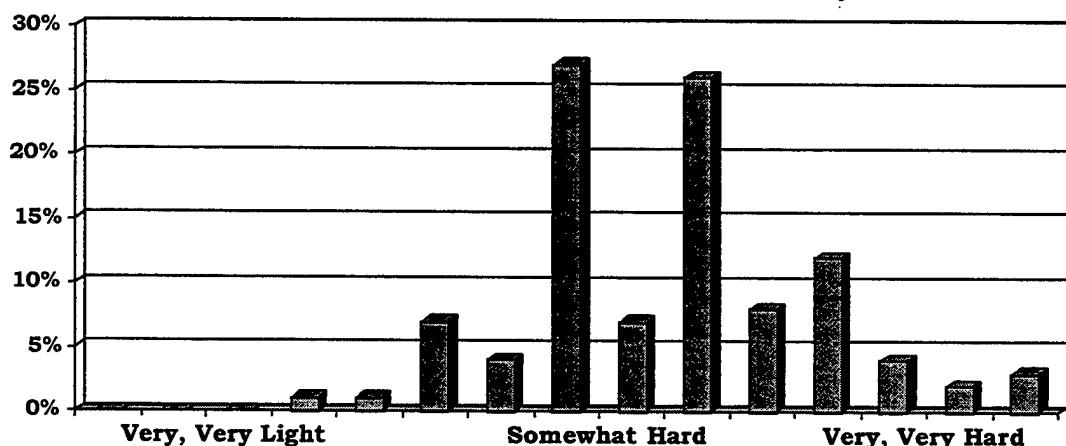
**Which military personnel members were most likely to report
exercising seven or more times per week?**

- Army members (34%)
- Single military members (40%)
- Military members between the ages of 21 and 35 (65%)

Intensity of Exercise

Most military members (88%) reported exercising at somewhat hard levels of exertion or greater (Figure 5-3). For the purposes of this study, exercise intensity was measured on the *Borg Scale of Intensity* (McArdle, Katch & Katch, 1996), a 16-point scale which measures exercise intensity and corresponds to maximum heart rate levels. The somewhat hard or greater levels correspond to 70% maximum heart rate, which in turn, increases aerobic capacity and produces a cardiovascular response.

Figure 5-3
Perceived Intensity of Exercise for Military Members



As shown in Table 5-3, 94% of Marine Corps and 92% of Army personnel stated that they exercised at this level of intensity or higher; this was followed by Navy (87%) and Air Force (84%). No difference was demonstrated by duty location or gender (Tables 5-11 to 5-15 in Appendix B).

Table 5-3
Perceived Intensity of Exercise by Service

Intensity	Army		Navy		Marine Corps		Air Force	
	n	%	n	%	n	%	n	%
Very, very light	4	0%	5	0%	1	0%	8	0%
	3	0%	4	0%	0	0%	1	0%
	5	0%	1	0%	1	0%	3	0%
Very light	13	1%	1	0%	3	0%	44	2%
	3	0%	28	1%	0	0%	26	1%
Fairly light	125	5%	185	8%	33	3%	207	8%
	51	2%	100	4%	28	2%	131	5%
Somewhat hard	524	22%	729	32%	192	17%	797	30%
	207	9%	160	7%	72	6%	191	7%
Hard	715	30%	577	25%	288	26%	624	24%
	160	7%	145	6%	134	12%	201	8%
Very hard	356	15%	228	10%	189	17%	222	8%
	103	4%	63	3%	82	7%	75	3%
Very, very hard	45	2%	47	2%	31	3%	31	1%
	81	3%	41	2%	67	6%	69	3%

Officers reported exercising at higher levels of intensity than did enlisted personnel (Table 5-4). Among officers, 93% reported exercising at somewhat hard levels or harder, compared to 87% of enlisted military members who reported these levels.

Table 5-4
Perceived Intensity of Exercise by Rank

Intensity	Enlisted		Officer	
	n	%	n	%
Very, very light	17	0%	2	0%
	6	0%	1	0%
	9	0%	1	0%
Very light	52	1%	10	1%
	51	1%	5	0%
	473	7%	59	3%
Fairly light	266	4%	35	3%
	1840	27%	304	22%
	497	7%	106	8%
Somewhat hard	1706	25%	414	30%
	463	7%	141	10%
	785	12%	176	13%
Hard	242	4%	71	5%
	120	2%	27	2%
	213	3%	35	3%

Body Mass Index (BMI) Comparisons

In order to classify military members and spouses into weight categories for comparison to national standards, the Body Mass Index (BMI) guidelines were used. These new standards issued in June 1998 (Table 5-5) are the most recent figures for personal weight and body mass assessment (National Heart, Lung, and Blood Institute [NHLBI], 1998). They replaced older more lenient estimates (Brownell & Fairburn, 1995). These new, more stringent guidelines have met with some objection in the civilian population since they have resulted in a significant portion of the population being reclassified as being overweight. This reclassification will also have impacts on the military.

Table 5-5
Classification of Overweight and
Obesity by BMI

Classification	BMI
Underweight	<18.5
Normal	18.5 - 24.9
Overweight	25.0 - 29.9
Obesity I	30.0 - 34.9
Obesity II	35.0 - 39.9
Extreme obesity	40.0 or greater

A major shortcoming of the BMI system is that it does not differentiate between muscle weight and fat weight. As a result, overweight resulting from obesity and that resulting from muscular development cannot be assessed. To do this would require the use of direct and indirect measurements of body composition such as densitometry, total body water, and total body potassium.

Using this method, individuals with high percentages of muscle can be classified as being overweight, while, in fact, they are not over fat. This may pose a particular problem when looking at military members who may be quite muscular. If the Department of Defense is interested in utilizing BMI, it may be an worthwhile area of future research to gather data on body fat percentages and compare them in relation to BMI levels. This would give a more accurate assessment of body composition and physical fitness.

Military Members

Most military members (50%) were found to be in the overweight category of new BMI standards (Table 5-6). Forty-four percent were classified as normal.

Table 5-6
Overall Military Member BMI

BMI	n	%
Underweight	71	1%
Normal	3,721	44%
Overweight	4,151	50%
Obesity I	409	5%
Obesity II	14	0%

Prior to June 1998, the BMI guidelines were calculated differently for each gender. As a result, overall comparisons to this study can not be done. The guidelines for this period were based on the following BMI cutoff points:

Males

Underweight = Less than 20.7
 Normal = 20.7 to 27.7
 Overweight = 27.8 to 31.0
 Obese = Greater than 31.1

Females

Underweight = Less than 19.1
 Normal = 19.1 to 27.2
 Overweight = 27.3 to 32.2
 Obese = Greater than 32.3

The new criteria have obviously had an enormous impact on the number of people now classified as overweight. The mean BMI score for military members was 25.2. The cutoff point for individuals to be considered overweight is 25.0. Nearly 20% of the sample was found to be within the 25 to 26 BMI range.

When analyzed by gender (Table 5-7), females (74%) were more likely to be classified as normal than were males (40%). Males were more likely to be overweight (54%) and obese (6%) than were females (23% and 1% respectively). No noticeable differences were noted among rank or duty location.

This table also presents for comparison BMI scores calculated using the criteria used prior to June 1998. A significant number of military members are now classified as overweight. This is comparable to the civilian population, where 55% of adults are now considered overweight (National Institutes of Health, 1998).

Table 5-7
 Overall Military Member BMI by Gender

	1998 BMI Guidelines				Previous BMI Guidelines			
	Male		Female		Male		Female	
	n	%	n	%	n	%	n	%
Underweight	29	0%	34	3%	208	4%	60	5%
Normal	2301	40%	948	74%	4,526	77%	1,153	89%
Overweight	3138	54%	293	23%	954	16%	81	6%
Obesity I	341	6%	14	1%	184	3%	4	0%
Obesity II	12	0%	0	0%	N/A	N/A	N/A	N/A

Analysis by service found some noticeable differences (Table 5-8). Navy members reported the highest levels of overweight and obesity (52% and 7% respectively) followed by Air Force (49% and 5%), Army (49% and 4%) and Marine Corps (48% and 2%).

Table 5-8

Overall Military Member BMI by Service

BMI	Army		Navy		Marine Corps		Air Force	
	n	%	n	%	n	%	n	%
Underweight	23	1%	15	1%	5	0%	27	1%
Normal	1096	47%	897	39%	544	50%	1161	45%
Overweight	1146	49%	1188	52%	519	48%	1275	49%
Obesity I	86	4%	170	7%	24	2%	128	5%
Obesity II	3	0%	8	0%	0%	0%	2	0%

Military Member Frequency and Intensity by BMI

Military members who were overweight (65%) and of normal weight (61%) were most likely to exercise three times per week or more (Table 5-9). Those who were underweight were least likely to exercise at this level (45%). It was also this group that was most likely to not exercise at all (25%).

Table 5-9

Overall Military Member BMI by Frequency of Exercise

Number of times	Underweight		Normal		Overweight		Obese	
	n	%	n	%	n	%	n	%
0	18	25%	584	16%	587	14%	64	15%
1	6	8%	326	9%	332	8%	42	10%
2	15	21%	546	15%	549	13%	68	16%
3	21	30%	808	22%	1033	25%	70	17%
4	5	7%	556	15%	614	15%	33	8%
5	3	4%	432	12%	500	12%	78	18%
6	0	0%	178	5%	200	5%	14	3%
7	1	1%	85	2%	112	3%	17	4%
More than 7	2	3%	200	5%	220	5%	37	9%

The majority of military members with normal weights (88%) reported exercising at somewhat hard levels of exertion or greater (Table 5-10). These high levels were also reported for those classified as overweight (88%) and those in the obese category (92%). The high levels of exertion in the later groups may be due to the fact that overweight members are often placed in special exercise programs to decrease their weight.

Table 5-10

Overall Military Member BMI by Level of Exercise Intensity

Intensity	Underweight		Normal		Overweight		Obesity	
	n	%	n	%	n	%	n	%
Very, very light	1	1%	7	0%	10	0%	0	0%
	0	0%	2	0%	7	0%	0	0%
	0	0%	9	0%	0	0%	1	0%
Very light	2	3%	24	1%	35	1%	1	0%
	1	1%	24	1%	30	1%	1	0%
Fairly light	4	6%	263	7%	245	6%	24	6%
	11	15%	135	4%	148	4%	12	3%
	21	30%	903	24%	1134	27%	154	37%
Somewhat hard	1	1%	285	8%	319	8%	8	2%
	17	24%	930	25%	1101	27%	103	25%
	3	4%	284	8%	317	8%	37	9%
Hard	3	4%	465	13%	463	11%	51	12%
	2	3%	159	4%	143	3%	15	4%
Very, very hard	1	1%	77	2%	74	2%	1	0%
	4	6%	134	4%	102	2%	11	3%

Reasons for Exercising

Two-thirds of respondents gave four or more reasons for exercising. At least 50% mentioned exercising for fitness, fun, weight-management, and to improve appearance.

Top 5 Reasons for Exercising

1. For fitness (65%)
2. For fun (59%)
3. To manage weight (51%)
4. To improve appearance (50%)
5. To manage stress (48%)

Table 5-11 shows that females were more likely to exercise for weight management (63%) and appearance (57%), while males were more likely to exercise for fitness (67%) and fun (62%). Officers were more likely to exercise for fitness (82%), to manage weight (62%), and for fun (60%), while enlisted personnel were more likely to exercise for personal development (41%). This data was consistent across service and duty location (Tables 5-23 to 5-32 in Appendix B).

Table 5-11
Reasons for Exercising by Rank

Reasons	Enlisted		Officer	
	n	%	n	%
To manage my weight	3280	48%	874	62%
For fun	3999	59%	843	60%
For personal development	2820	41%	554	39%
For fitness	4171	61%	1160	82%
To manage stress	3139	46%	806	57%
To improve appearance	3259	48%	819	58%

Approximately two-thirds of all respondents indicated that exercise was helpful to their job. As shown in Table 5-12, 75% of officers reported exercise helps or greatly helps with their jobs, compared to 64% of the enlisted personnel. The findings were consistent across gender, service, and duty location (Tables 5-28 to 5-32 in Appendix B).

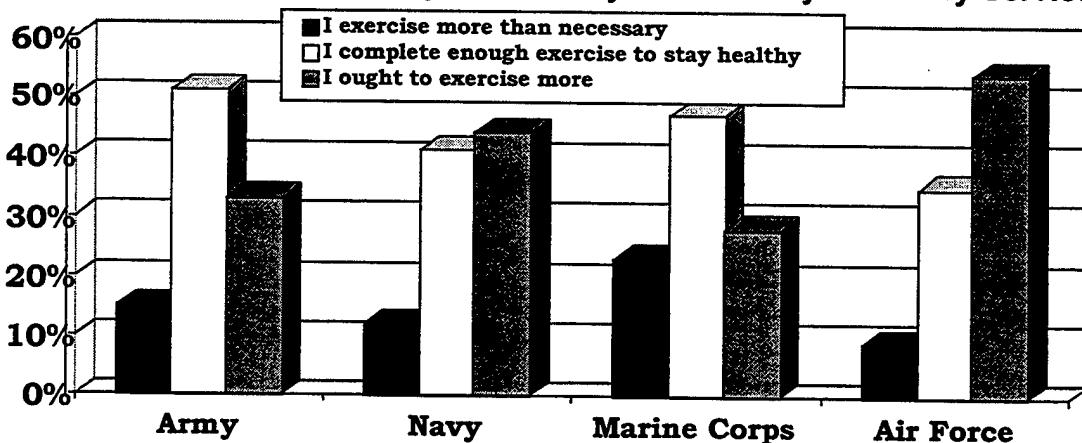
Table 5-12
Effect of Exercise on Job Performance by Rank

Effect	Enlisted		Officer	
	n	%	n	%
Greatly hurts	92	1%	4	0%
Hurts	246	4%	40	3%
Does not affect it	2095	31%	304	22%
Helps	2676	40%	612	44%
Greatly helps	1625	24%	441	31%

Perceptions of Personal Physical Activity Levels

Of all military members, 42% thought they should exercise more, and 43% thought they exercised enough to stay healthy (Figure 5-4). Fourteen percent felt they exercised more than necessary. At least 50% of both genders believed that they exercise at least enough to stay healthy. However, 48% of females reported that they should increase their exercise. At least half of the respondents in all services, with the exception of the Air Force, reported that they believed they were exercising at least enough to stay healthy. Large percentages of Navy (44%) and Air Force (54%) members felt they should exercise more. No difference was demonstrated by duty location (CONUS/OCONUS) or rank (Tables 5-33 to 5-37 in Appendix B).

**Figure 5-4
Military Member Perceptions of Physical Activity Levels by Service**



Factors Which Would Increase Exercise

The most frequent response (35%) to the question "What would motivate you to increase your level of exercise?" was "Nothing" (Table 5-13). Of those who reported nothing, at least 50% of members in all services reported exercising three times per week or more. Male military members who reported that nothing could motivate them, were more likely to exercise three times per week or more (62%) than were females (55%).

Those respondents who reported exercising less than three times per week were analyzed: of this group, the leading motivating factors were a ribbon or medal (25%) and certificates (16%). However, 35% said nothing would motivate them. Twenty-one percent marked "other" to this question, and 20% reported unit

commander or higher recognition (Table 5-13). An analysis of the write-in responses indicated that time allowances, money, and points toward promotion could be significant motivators. These percentages tended to remain consistent across gender, duty location, and service (Tables 5-38 to 5-42 in Appendix B).

Table 5-13
Factors Which Would Increase Exercise by Military Members

Factors	n	%
Nothing would motivate me to increase my activity	3,031	35%
A ribbon or medal	2,117	25%
Other (Please specify)	1,840	21%
Unit commander or higher level recognition (Verbal or written)	1,696	20%
A certificate	1,383	16%
A patch	1,039	12%

Officers were more likely than enlisted personnel to state that nothing (46% of officers vs. 32% of enlisted personnel) would motivate them to exercise more. However, for both groups the majority of respondents (63% of officers and 60% of enlisted personnel), who reported nothing, exercised three times per week or more. Enlisted personnel were more likely than officers to be motivated by certificates (18% compared to 8% of officers), patches (13% compared to 9%) or unit commander recognition (21% compared to 14% of officers).

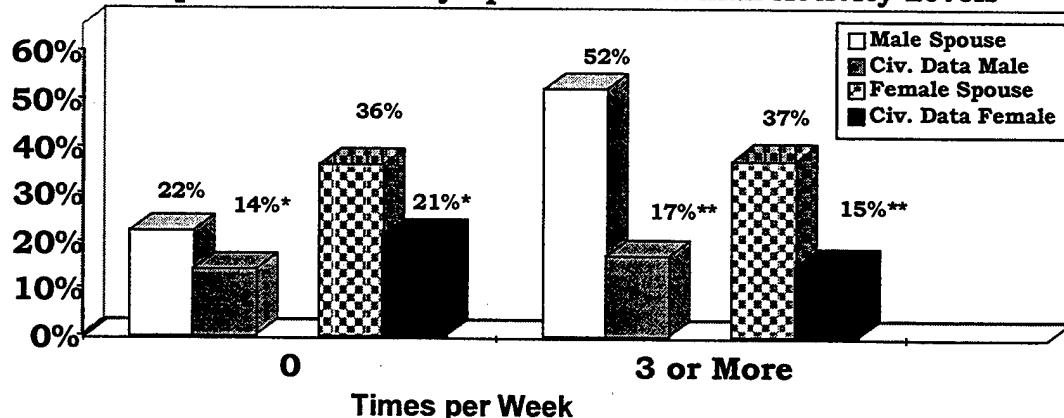
5B. Military Spouses

Frequency of Exercise

Spouses were also asked how many times they had exercised in the past 7 days. One-third reported no exercise at all in the previous week, and 27% exercised less than three times per week. Males were more likely than females to exercise at least three times a week. Over one-third of females reported no exercise at all in the previous week.

Military spouses reported exercising three or more times per week at a higher frequency than a comparable group of civilians (Surgeon General's Report, 1996; Healthy People 2000, 1990). However, those spouses who reported no activity in the previous week also outnumbered a comparable group of civilians (Figure 5-5). No appreciable differences were demonstrated between the services (Tables 5-43 to 5-45 in Appendix B).

Figure 5-5
Comparison of Military Spouse and Civilian Activity Levels



* Source: NHANES III (1988-1991)

** Source: NHIS (1991)

Intensity of Exercise

Overall, the majority of spouses (71%) reported exercising at somewhat hard or higher levels (Figure 5-6). Fewer female spouses (68%) reported exercising at this level as compared to 79% of male spouses.

Figure 5-6
Perceived Intensity of Exercise for Spouses

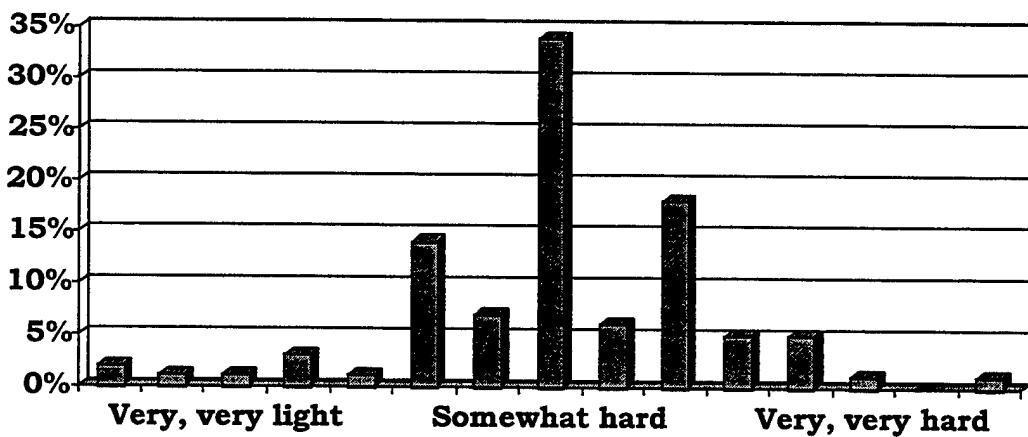


Table 5-14 shows that intensity of exercise varied among the services. The highest levels of intensity were reported in the Marine Corps with 75% of spouses reporting exercising at somewhat hard levels or higher followed by Army (74%), Air Force (70%), and Navy (66%) spouses.

Table 5-14
Perceived Intensity of Exercise by Military Spouses

Intensity	Army		Navy		Marine Corps		Air Force	
	n	%	n	%	n	%	n	%
	29	1%	9	1%	2	1%	30	3%
Very, very light	14	2%	3	0%	1	0%	6	1%
	7	1%	2	0%	4	1%	5	0%
Very light	32	4%	34	4%	19	4%	32	3%
	8	1%	11	2%	2	1%	8	1%
Fairly light	105	12%	169	18%	43	12%	160	15%
	46	5%	73	9%	21	6%	75	7%
Somewhat hard	297	33%	319	34%	97	28%	420	38%
	49	5%	60	6%	25	7%	59	5%
Hard	201	22%	134	14%	69	20%	179	16%
	52	6%	38	4%	22	6%	61	6%
Very hard	39	4%	58	6%	28	8%	49	4%
	16	2%	7	1%	13	4%	12	1%
Very, very hard	1	0%	4	0%	4	1%	2	0%
	16	2%	8	1%	2	1%	5	0%

Body Mass Index (BMI) Comparisons

Most military spouses (52%) were found to be in the normal category of BMI standards (Table 5-15). Thirty-five percent were classified as overweight and 10% were obese. The obese percentage was much higher than that of military members (5%). Calculations used the most recent BMI standards for the civilian population. In certain cases, individuals who do not have high levels of body fat, but high levels of muscle can be classified as being overweight. To better assess this, BMI levels should be used in conjunction with measures of body fat.

Table 5-15
Overall Spouse BMI

BMI	n	%
Underweight	107	3%
Normal	1,800	52%
Overweight	1,202	35%
Obesity I	245	7%
Obesity II	67	2%
Extreme obesity	40	1%

When analyzed by gender, findings of spouse BMI were similar to military members (Table 5-16). Male spouses (60%) were more likely than female spouses (23%) to be classed as overweight. However, females were more likely to be classed as obese (12%) than males (7%). No differences were noted among services.

Table 5-16
Overall Spouse BMI by Gender

BMI	Male		Female	
	n	%	n	%
Underweight	4	0%	82	4%
Normal	255	32%	1152	61%
Overweight	484	60%	434	23%
Obesity I	58	7%	147	8%
Obesity II	4	0%	46	2%
Extreme obesity	2	0%	29	2%

Military Spouse Frequency and Intensity by BMI

Military spouses who were overweight (46%) and of normal weight (41%) were most likely to exercise three times per week or more (Table 5-17). Those who were underweight were least likely to exercise at this level (25%). It was also this group that was most likely to not exercise at all (47%).

Table 5-17
Overall Spouse BMI by Frequency of Exercise

Number of times	Underweight		Normal		Overweight		Obese	
	n	%	n	%	n	%	n	%
0	49	47%	539	31%	300	27%	129	37%
1	24	23%	176	10%	130	12%	36	10%
2	6	6%	296	17%	173	16%	49	14%
3	6	6%	315	18%	186	17%	51	15%
4	5	5%	161	9%	104	9%	43	12%
5	11	10%	139	8%	101	9%	18	5%
6	1	1%	34	2%	43	4%	8	2%
7	1	1%	31	2%	21	2%	8	2%
More than 7	2	2%	39	2%	52	5%	5	1%

The majority of spouses with normal weights (72%) reported exercising at somewhat hard levels of exertion or greater (Table 5-18). These high levels were also reported for those classified as overweight (79%) and those in the obese category (63%). The lowest intensity of exercise was found among those in the underweight category (61%).

Table 5-18
Overall Spouse BMI by Level of Exercise Intensity

Intensity	Underweight		Normal		Overweight		Obese	
	n	%	n	%	n	%	n	%
Very, very light	3	3%	34	2%	18	2%	11	3%
	0	0%	17	1%	6	1%	1	0%
	4	4%	10	1%	1	0%	0	0%
Very light	4	4%	52	3%	39	4%	14	4%
	2	2%	17	1%	7	1%	0	0%
Fairly light	14	13%	264	15%	109	10%	64	19%
	16	15%	92	5%	67	6%	36	11%
	38	36%	585	34%	382	35%	111	33%
Somewhat hard	4	4%	108	6%	69	6%	17	5%
	12	11%	322	19%	205	19%	46	13%
	7	7%	86	5%	83	8%	14	4%
Hard	1	1%	86	5%	80	7%	20	6%
	2	2%	28	2%	19	2%	3	1%
Very, very hard	0	0%	4	0%	8	1%	0	0%
	0	0%	16	1%	12	1%	4	1%

Reasons for Exercising

The most frequently reported reasons for exercising by spouses were to manage weight, for fitness, to improve appearance, and to manage stress; these reasons were basically the same as those given by military members. Female spouses most often indicated that they exercised to manage weight and improve appearance. The majority of both male and female spouses indicated exercise was helpful to their job. No appreciable difference was found among spouses from different services (Tables 5-54 to 5-56 in Appendix B).

Top 5 Reasons Why Spouses Exercise

1. To manage weight (58%)
2. For fitness (57%)
3. To improve appearance (50%)
4. For fun (42%)
5. To manage stress (41%)

Perceptions of Personal Physical Activity Levels

The majority of spouses (62%) thought they should exercise more (Table 5-19). Approximately one-third thought they exercised enough to stay healthy, while only 5% thought they exercised more than necessary. Females were more likely than males to state that they should exercise more (67% vs. 50%). There was little difference among services in regard to their perceptions of physical activity (Tables 5-60 to 5-62 in Appendix B).

Table 5-19
Perception of Physical Activity by Spouses

Perceptions	n	%
I ought to exercise more	2,222	62%
I complete enough exercise to stay healthy	1,116	31%
I exercise more than necessary	192	5%
Don't know	56	2%

Factors Which Would Increase Exercise

The largest percentage of spouses (28%) indicated that on-site childcare would motivate them to exercise more (Table 5-20). This differed somewhat by gender, with 39% of female and 15% of male spouses indicating childcare as a concern. Across the services, more Army (36%) and Marine Corps (34%) spouses reported that on-site childcare would motivate them. The second most motivating factor (23%) would be an increase in organized activities. Male spouses were over three times more likely to value competitive events than their female counterparts.

Of those who reported that nothing would motivate them, 48% reported exercising three times per week or more. Spouses who reported exercising less than three times per week were also analyzed to determine what would motivate them. Of this group, 34% reported childcare as a leading factor. This was followed by more organized activities (25%) and nothing (17%).

Table 5-20
**Factors that Would Increase Exercise
of Spouses**

Factors	n	%
On-site childcare	1,141	28%
Other (Please specify)	1,013	25%
More organized activities	924	23%
Nothing would motivate me	666	16%
Competitive events	348	8%

Nineteen percent of male spouses and 16% of female spouses indicated that nothing would motivate them to increase their exercise. Of these groups, males (57%) were more likely than females (40%) to exercise three times per week. When analyzed by service, of those spouses who said nothing would motivate them, the majority of Army (55%) and Marine Corps (57%) spouses reported exercising at least three times per week. The majority of Navy (56%) and Air Force (58%) spouses reported exercising less than three times per week.

5C. Military Children

Frequency of Activity

Military spouses reported that 79% of preschoolers engaged in active play for 3 or more hours per weekday with an increase to 85% on weekends. Only 7% reported no exercise by their preschooler. There were no appreciable differences between boys and girls. Most parents perceived their children, preschoolers to teenagers, to be as active or more active than other children. In the K-4 grade group, girls were perceived as slightly less active than boys with this difference increasing as the children got older.

In the sample of children in grades K-4, 79% reported exercising or playing sports outside of physical education (PE) class. Boys (83%) were more likely to exercise outside of PE class than were girls (75%). In this age group, 47% of the children reported having PE class at least three times per week. No differences were found among services (Tables 5-66 to 5-73 in Appendix B).

Among children in grades 5-8, 83% reported exercising or playing sports outside of PE class. Again, boys (87%) were more likely to exercise outside of PE class than were girls (79%). Sixty-three percent of this group had PE class at least three times a week. Few differences were noted between gender. There were too few respondents in this age category to determine if there were any significant differences among services using data from the spouse survey. In order to analyze grades 5-8 findings by service, data provided by the military member questionnaire was used. Based on this data, Army children were most likely (77%) to participate in PE classes three times per week or more compared to Marine Corps (60%) and Navy and Air Force (65% each).

Finally, among teenagers, 78% reported exercising or playing sports outside of PE class. Boys (85%) were much more likely to exercise outside of PE class than were girls (67%). Sixty-one percent reported having PE class at least three times per week. Again, in order to analyze teenage findings by service,

data provided by the military member questionnaire was used. Based on this data, Marine Corps teenagers were least likely (54%) to participate in PE classes three times per week or more compared to 61% of Navy, Marine Corps, and Air Force teenagers.

Across all groups, boys were more likely than girls to participate in activities outside of PE class. This difference increased steadily as children grew older. There was little difference among services for children in K-4 and grades 5-8. However, among teenagers, 90% of those in Marine Corps families were reported to exercise outside of PE class as compared to Navy (70%) and Army and Air Force (80% each).

Participation in Physical Activity Classes by Duty Location

Due to limited number of responses to the family questionnaire, the following information was generated using data drawn from the member questionnaire for children in grades K-4. Stateside children were more likely to participate in PE classes three times per week or more (50% CONUS vs. 42% OCONUS). This was also true for children in grades 5-8 (72% of CONUS vs. 53% OCONUS) and for teenagers (63% of CONUS vs. 45% OCONUS). CONUS teenagers (40%) and grades 5-8 children (35%) were much more likely to participate in PE classes five times or more per week than were OCONUS teenagers (16%) and grades 5-8 children (18%).

5D. Discussion

Military Members

Healthy People 2000's Objective 1.5 states that the proportion of sedentary Americans should be reduced to 15% by the year 2000 (Surgeon General's Report, 1996; *Healthy People 2000*). This report and that of the Surgeon General reveal that approximately one-fourth of adults in the United States, ages 18 and over, do not participate in leisure-time physical activity, and approximately 19% of men and 24% of women, ages 18-44, report being inactive.

Overall, rates of inactivity for military members were comparable to civilian data reported in the *Third National Health and Nutrition Examination Survey* (NHANES III, 1988-1991), *National Health Interview Survey* (NHIS, 1991), and

Behavioral Risk Factor Surveillance System (BRFSS, 1992). Military women had higher rates of inactivity compared to military men. This finding was also consistent with national civilian data. The majority (64%) of both male and female military members met the recommendations of health agencies to exercise at least three times per week, compared to less than 20% of the civilian population (Surgeon General's Report; Healthy People 2000). Data suggest that, while rates of inactivity may be comparable to that of civilians, military members who do exercise tend to place more emphasis on a consistent fitness routine.

Navy and Air Force members reported being inactive more frequently than did Army and Marine Corps members. The majority of both officers and enlisted Navy personnel participated in mandatory PT, compared to less than 15% of Air Force personnel. Over three-quarters of Army and Marine Corps personnel exercised at least three times per week, and the majority participated in mandatory PT. The proportion of Army and Marine Corps members who exercised more than three times per week was four times higher than that reported by civilians (Surgeon General's Report, 1996; Healthy People 2000, 1990).

The proportion of Air Force and Navy members who exercised more than three times per week was three times higher than that reported by civilian data (Surgeon General's Report, 1996; Healthy People 2000, 1990). Results suggest that the emphasis on physical fitness varies among the services. The DoD has issued a directive addressing physical fitness standards in the military. However, each service is responsible for interpreting the DoD directive according to its own particular needs and mission (Quarrie, 1989). A synthesis of service standards and individual service programs into more centralized facilities and programs might help make exercise more consistent across the services.

Two-thirds of respondents gave multiple reasons for exercising. Overall, the majority of military members exercised for fitness, fun, and to manage their weight. Women were more likely to exercise for weight management and appearance, while men were more likely to exercise for fitness and fun. Approximately equal proportions of military members reported both that they exercised enough to stay healthy and that they should increase their exercise. Females were more likely than males to report that they should increase their exercise activity. However, one-third of military members indicated nothing would motivate them to increase exercise. The majority of these individuals were already exercising at least three times per week. Time allowances, money, and points toward promotion could be significant motivators for many military members.

Military Spouses

One indicator of a child's level of physical activity is the exercise level of his/her parents (Sallis, Patterson, McKenzie & Nader, 1988). Military parents overall tended to exercise more frequently than their civilian counterparts. While levels of inactivity for military members were found to be comparable to civilian levels; however, military spouses had a much higher rate of inactivity (Surgeon General's Report; Healthy People 2000). Spouses of military members, who did exercise, tended to do so much more frequently than civilians. Because military spouses had a higher frequency than average of physical inactivity, it would be advantageous to promote increased physical activity of military spouses.

The majority of military spouses reported that they exercised to manage weight, for fitness, and to improve appearance. Female spouses most often indicated that they exercised to manage weight and improve appearance. Over half of the spouses reported that they should exercise more often. A higher proportion of females than males indicated that they should exercise more often. Almost one-third of spouses stated that on-site childcare would motivate them to exercise more.

Military Children

Since attitudes about physical activity are often patterned by events that happen early in life, a goal for preschool children should be to develop a positive outlook about exercise while setting the stage for routine participation in enjoyable physical activity over the course of a lifetime (Levine & Dougherty, 1997). Military spouses reported that over three-quarters of preschool children engaged in active play for 3 or more hours per day. Since it is important for young children to develop healthy exercise patterns, it would be beneficial to promote more fitness programs designed for young children.

Even if children do not engage in physical activity at home, most children have the opportunity to participate in physical education (PE) classes at school. *Healthy People 2000* (1990) Objective 1.8 states that at least 50% of children in grades 1-12 should participate in daily school PE classes, compared to the baseline of 36% of children in 1984-1986. According to the *1995 Youth Risk Behavior Survey*, 62% of boys and 57% of girls in grades 9-12 reported enrollment in PE classes in school. However, only 27% of boys and 23.5% of girls were enrolled in daily PE classes (Surgeon General's Report, 1996; Healthy People 2000).

While the majority of military children in grades 7-12 participated in PE classes at least three times per week, this proportion was much lower for children in grades K-6. Fewer military children participated in PE classes on a daily basis. Only 21% of children in grades K-4, 34% of children in grades 5-8, and 41% of children in grades 9-12 participated in PE classes five or more times per week. Proportions were below the *Healthy People 2000* objective of 50% (Surgeon General's Report, 1996; Healthy People 2000, 1990).

Over three-quarters of military children in grades K-12 were reported to exercise or play sports outside of PE class. Teenage girls, however, reportedly were involved in fewer outside activities. Of those military children in grades K-8 who did not participate in PE classes in school, one-third were also not involved in outside activities. Fewer military children (24%) in grades 9-12 reported neither participation in PE classes in school nor involvement in any outside activities. Results suggest that most military children are participating in school-based PE classes and outside activities. Schools and communities need to offer a wide range of facilities and programs to promote and maintain the development of healthy exercise habits in children. These facilities would be best utilized if they included activities such as swimming, team sports, and walking/running trails.

Intensity of Physical Activity

Most health agencies recommend at least 20 minutes of moderate intensity exercise on a regular if not daily basis. While it is important for individuals to adopt consistent exercise habits of sufficient duration, exercise intensity is also an important factor. Evidence suggests that individuals who exercise both regularly and vigorously would be expected to gain the greatest improvements in cardiovascular fitness (Surgeon General's Report, 1996; Healthy People 2000, 1990). To improve aerobic capacity, exercise needs to be intense enough to increase heart rate to about 70% of maximum. This corresponds to a somewhat hard rating of perceived exertion (RPE) on the *Borg Scale* (McArdle, Katch & Katch, 1996).

Most military members (88%) exercised at somewhat hard levels of exertion. Over half of all military members exercised at the somewhat hard level three or more times per week for at least 15 to 20 minutes, which exceeds health agency recommendations. Over one-fourth (28%) reported exercising at hard levels of exertion. However, fewer women than men reported exercising at both somewhat hard and hard levels of exertion.

Army (70%) and Marine Corps (76%) members were more likely to report exercising at somewhat hard levels of exertion three or more times per week compared to Air Force (46%) and Navy (55%) members. The 1995 *Department of Defense Survey of Health Related Behaviors Among Military Personnel* reported that 65.4% of all military members, approximately 80% of Army and Marine Corps members, and 50% to 58% of Navy and Air Force members engaged in strenuous exercise (>50% MAX HR) at least three days per week, for at least 20 minutes per occasion, in the past month (Bray, et al., 1995). While proportions were similar, the present study used a higher standard for strenuous activity (70% MAX HR vs. 50% MAX HR). The 1991 NHIS and 1992 BRFSS surveys found that less than 20% of civilian counterparts participated in regular, vigorous exercise (>50% MAX HR) (Surgeon General's Report, 1996; Healthy People 2000, 1990). Findings suggest that compared to civilians, more military members are exercising at levels strenuous enough to improve aerobic capacity and, thus, cardiovascular fitness.

The majority (71%) of military spouses also reported exercising at somewhat hard levels of exertion, which was much higher than their civilian counterparts. Fewer spouses (14%) reported exercising at hard levels of exertion compared to military members. When separated by gender, female spouses were less likely to report exercising at hard levels of exertion. Marine Corps spouses were more likely to report exercising at hard levels of exertion when compared to the other services. Data suggests that the majority of military spouses are exercising at levels of intensity consistent with health agency recommendations to improve cardiovascular fitness.

5E. Summary and Implications

Military Members

- The majority of military members met health recommendations to exercise three times a week or more at moderate intensity or greater for at least 15 to 20 minutes.
- The highest frequency of exercise reported was by Army and Marine Corps members.
- More members of the Air Force and Navy reported exercising fewer than three times per week than did members of the other services.
- Twenty-three percent of those who were not required to participate in mandatory PT reported no exercise in the previous week. Only 7% of those who were required to perform PT reported not exercising in the last week.
- The majority of military members (88%) reported exercising at somewhat hard levels to very, very hard levels of exertion.
- The mean BMI score was 25.2 for military members. The new cutoff for being considered overweight is 25. Nearly 20% of the sample was found to be within the 25 to 26 BMI range.
- The top three reasons for exercising were for fitness, fun, and to manage weight.
- Approximately two-thirds of respondents reported that exercise helped their job performance.
- About half of the respondents thought that they exercised enough to stay healthy. Females were more likely than males to think they should exercise more.
- More than half of all Air Force respondents believed they should exercise more.
- Over one-third of military members reported that nothing would motivate them to increase their frequency of exercise.

- More military members reported exercising three or more times per week than did a comparable population of civilians.
- Fifteen percent of military members did not exercise at all in the preceding week. This was comparable to civilian data.

Implications

Continue current programs that promote physical activity and fitness among Armed Forces members and their families.

Although most military members reported exercising at least three times per week for 15-20 minutes; over one-third did not. These people were more likely to be women, Air Force and Navy personnel, and those who were not required to perform mandatory PT. Programs targeted at these groups could be effective at increasing the exercise levels for military members as a whole.

Since the majority of military members are now considered overweight under the new BMI standards, DoD may wish to also use measures of body fat to get a more accurate picture of the fitness of its members.

Since the top reasons for exercising were fitness, fun, and weight management, programs designed to emphasize these aspects could be used to target specific populations and to increase participation.

Those who were required to participate in mandatory PT reported exercising at higher rates than did those who did not. In addition, it was suggested that time scheduled during the workday would help to increase exercise levels. Combinations of these two factors could help to provide military members with the time and motivation to participate more regularly in exercise programs, since exercise was cited as greatly improving job performance by military members.

Military Spouses

- Less than half of military spouses exercised three times a week or more. However, this was substantially more exercise than done by a comparable group of civilians.
- The number of male and female spouses who did not exercise in the previous week was substantially higher than those for a comparable group of civilians (14% and 21% respectively).
- Female spouses exercised less frequently than did male spouses.
- Army and Marine Corps spouses were more likely to exercise seven or more times a week.
- Air Force spouses were the most likely group to report no exercise in the previous week.
- Of those spouses that exercise, most (71%) reported exercising at somewhat hard levels to very, very hard levels of exertion.
- The mean BMI score for military spouses was 24.8. The new cutoff for being considered overweight is 25.
- Most military spouses were in the normal weight category. However, there were also more that were in the obese category as compared to military members.
- Spouse reasons for exercise were to manage weight, for fitness, to improve appearance, and for fun. These reasons were the same as those given by military members, however, in somewhat different proportions.
- The majority of spouses indicated that exercise was beneficial to their job.
- Sixty-two percent of spouses thought that they should exercise more.
- To increase motivation to exercise, female spouses most often cited a need for childcare services. Male spouses most often wanted more competitive events. Both wanted more organized events.

Implications

Continue current programs that promote physical activity and fitness among Armed Forces members and their families.

Since 12% of the spouses were categorized as obese, specialized programs could be developed to encourage fitness and weight reduction.

Organized and managed programs that emphasize weight management, stress management, and fitness could be developed and provided for spouses and military members.

On-site childcare could be made available at fitness centers.

Military Children

- Girls exercised less frequently as they got older than did boys.
- Most parents perceived their children to be as active or more active than other children their age. Most children participated in exercise outside of PE class.
- Across all grades, most children participated in PE classes three times a week or more.
- The majority of children in grades 5-12 participated in PE class five or more times per week.

Implications

Additional programs for children designed to focus on individual and team sports as well as organized programs could be developed and targeted toward girls.

6. Physical Activity Preference and Location

6A. Military Members

Favorite Activities

Respondents were asked to list the four physical activities they participated in most frequently. Overall, members reported participating in running/jogging, weight training, basketball, and walking. Other leading activities were using exercise equipment, golfing, bicycle riding, calisthenics, softball, and aerobics.

Top 10 Activities for Military Members

- | | |
|------------------------------------|-------------------------|
| 1. Running/Jogging (54%) | 6. Golfing (16%) |
| 2. Weight Training (34%) | 7. Bicycle Riding (16%) |
| 3. Basketball (20%) | 8. Calisthenics (10%) |
| 4. Walking (18%) | 9. Softball (10%) |
| 5. Use of Exercise Equipment (16%) | 10. Aerobics (4%) |

There were some gender differences in activity preferences. Male members reported as their most common activities running/jogging (53%), weight training (35%), basketball (22%), walking (13%), using exercise equipment (14%), and golfing (15%). The leading activities for females were running/jogging (54%), walking (33%), aerobics (27%), and weight training and exercise equipment (23% each).

Within each service, running/jogging continued to be the most frequently reported activity, with weight training again the second most cited activity. Air Force members followed the same general pattern but had more personnel involved in a greater variety of activities, such as bowling (9%) and racquetball (8%). The overall patterns remained basically the same for officers and enlisted personnel, with only slight changes in order. The top three activities were the same, regardless of rank. There was no appreciable difference in activity preferences by duty location (Tables 6-1 to 6-5 in Appendix B).

Where Members Exercise

The majority of military members exercised on installation (Table 6-1). Basically, this same pattern was true for officers and enlisted personnel, but some slight differences are shown between the two. Enlisted personnel reported walking (61%) and performing calisthenics (89%) more often on installation than did officers (62%). Officers were more likely to swim (74%) on installation than were enlisted personnel. These findings were consistent regardless of gender, service, and whether stationed CONUS or OCONUS (Tables 6-6 to 6-10 in Appendix B).

Table 6-1
Participation In Sports by Location of Activities

Sports	Off Installation		On Installation	
	n	%	n	%
Aerobics	197	24%	613	76%
Basketball	260	16%	1365	84%
Bicycle riding	624	49%	658	51%
Calisthenics	119	12%	838	88%
Exercise equipment	240	18%	1102	82%
Golfing	282	26%	794	74%
Running/jogging	696	16%	3776	84%
Softball	105	11%	859	89%
Walking	588	41%	859	59%
Weight training	372	13%	2417	87%

Reasons for Not Using On-Installation Facilities

Individuals who reported using only off-installation facilities were asked to give their reasons for not using on-installation facilities (Table 6-2). At least 10% of

Table 6-2
Reasons For Not Using On-Installation Facilities
by Users of Only Off-Installation Facilities

Reasons	n	%
Facility is crowded	1237	43%
Hours of operation not convenient	814	28%
Distance is too far to travel	604	21%
Poor quality facilities	590	20%
Other (Please specify)	513	18%
Poor quality equipment	466	16%
Poor customer service	434	15%
Lack of childcare	432	15%
Limited parking	406	14%
Poor ventilation/acoustics/lighting	396	14%
Not family oriented	355	12%

the sample reported overcrowding, inconvenient hours of operation, too far to travel, poor quality facilities, poor quality equipment, poor customer service, lack of childcare, limited parking, poor ventilation/acoustics, and facility not family oriented. These findings were for the most part consistent by gender. However, female military members reported more concern with childcare and inconvenient hours of operation than did males.

Twenty-eight percent of all military members reported that the hours of operation of on-installation facilities were not convenient. In addition, the services agreed that the distance to travel and facilities being too crowded were major problems. These members also felt that on-installation facilities were not family oriented. More than 25% of the Army and Marine Corps members stated that poor quality of facilities was a problem, and over 20% reported poor quality of equipment on installation. The Army was more likely than the other services to list poor quality programs, while the Navy cited limited parking. When looking at these issues by rank, the overall reasons for not using on-installation facilities remained the same. However, a larger percentage of enlisted personnel reported lack of childcare as a main reason (16% compared to 10% of the officers). Officers were more likely to cite poor quality on-installation facilities (27%) and poor ventilation/acoustics (19%). These findings did not differ by duty location (Tables 6-11 to 6-15 in Appendix B).

Reasons for Not Using Off-Installation Facilities

Table 6-3 lists the responses from individuals when asked why they did not use off-installation facilities. Reasons given by at least 10% of the sample included cost too much, not familiar with facilities, too far to travel, don't know what programs are available, and inconvenient hours of operation. The reasons did not vary by gender, service, rank, or duty location (Tables 6-16 to 6-20 in Appendix B).

Table 6-3
Reasons for Not Using Off-Installation Facilities
by Users of On-Installation Facilities

Reasons	n	%
Cost too much	1320	51%
No experience with facilities	781	30%
Distance is too far to travel	636	25%
Other (Please specify)	363	14%
Don't know what programs are available	311	12%
Hours of operation not convenient	260	10%

Reasons for Using Off-Installation Facilities

Table 6-4 lists the reasons for using off-installation facilities. More than 50% of military members listed a more convenient location as a major reason for using off-installation facilities. The top three reasons also included more convenient hours of operation (36%), and more modern equipment/facilities (31%). By gender, the top three reasons remained the same. The fourth leading reason for using off-installation facilities for females was childcare availability (23%), followed by personal trainers (19%). For males, the fourth and fifth reasons cited were better customer service (18%), and only facility available (15%).

Table 6-4
Top Reasons for Using Off-Installation Facilities

Reasons	n	%
More convenient location	1328	52%
More convenient hours of operation	917	36%
More modern equipment and facilities	805	31%
Other (Please specify)	740	29%
Better customer service	508	20%
Only facilities available in this geographic area	424	16%
Feel more welcome than on installation	374	15%
Childcare available on site	356	14%
More professional staff	340	13%
Personal trainers available	298	12%
More staff with certification credentials	191	7%
Less expensive	75	3%

More than 50% of both Navy and Air Force personnel, and at least one-third of Army and Marine Corps members cited a more convenient location as their reason for using off-installation facilities (Table 6-5). At least one quarter of members of all services cited more convenient hours of operation as a factor. Army and Marine Corps personnel were more likely to list better customer service and more professional and credentialed staff. One-third of Army and Marine Corps members listed more modern equipment and facilities. There was no noticeable difference among duty location or rank in regard to this question (Tables 6-21 to 6-25 in Appendix B).

Table 6-5
Top Reasons for Using Off-Installation Facilities by Service

Reasons	Army		Navy		Marine Corps		Air Force	
	n	%	n	%	n	%	n	%
More convenient location	279	37%	451	53%	127	38%	468	52%
More convenient hours of operation	289	38%	224	26%	123	36%	272	30%
Better customer service	162	21%	121	14%	82	24%	140	16%
Feel more welcome	109	14%	108	13%	49	15%	105	12%
Only facilities available in this area	156	20%	101	12%	48	14%	115	13%
More professional staff	133	17%	68	8%	51	15%	88	10%
More staff with certification credentials	73	10%	32	4%	27	8%	57	6%
Personal trainers available	111	15%	63	7%	33	10%	85	10%
Less expensive	17	2%	20	2%	15	4%	18	2%
More modern equipment and facilities	283	37%	192	22%	119	35%	206	23%
Childcare available on site	103	13%	84	10%	38	11%	131	15%
Other (Please specify)	198	26%	205	24%	74	22%	251	28%

Suggested Improvements for On-Installation Facilities

Individuals who reported using only off-installation facilities were asked to suggest recommendations that could improve on-installation facilities. The two most often suggested improvements were more convenient hours of operation and increased amount/type of equipment available (Table 6-6).

Table 6-6
**Suggested Improvements for On-Installation Facilities
by Off-Installation Facility Users**

Suggested improvements	n	%
More convenient hours of operation	965	33%
Increased amount/type of equipment	949	33%
Additional workout space	540	19%
Shorter waiting times	525	18%
Childcare available	479	17%
More equipment in working order	393	14%
Other (Please specify)	379	13%
Repair/renovation of building	341	12%
Better ventilation/acoustics/lighting	326	11%
Better advertising and promotion	317	11%
More special programs	313	11%
Additional parking	303	11%
Nothing else would increase my use	301	10%
Better customer service	297	10%
Nationally known fitness franchise	286	10%

At least 15% of Army respondents suggested additional workout space, more equipment in working order, shorter waiting times, and childcare available (Table 6-7). Navy members (15% or more) were most concerned with additional workout space and additional parking. Marine Corps members suggested additional workout space, repair and renovation of buildings, as well as more equipment in working order and shorter waiting times.

Air Force members were most interested in increased childcare available, shorter waiting times, additional workout space, and better ventilation/acoustics/lighting. When analyzed by rank, the same general patterns were found. However, enlisted personnel were more likely to cite childcare (18%) and more convenient hours of operation (34%) than were officers. These responses did not vary by gender, rank, or duty location (Tables 6-26 to 6-30 in Appendix B).

Table 6-7
Suggested Improvements for On-Installation Facilities by
Off-Installation Facility Users by Service

Suggested Improvements	Army		Navy		Marine Corps		Air Force	
	n	%	n	%	n	%	n	%
More convenient hours of operation	304	40%	228	27%	114	34%	311	35%
Better advertising and promotion	86	11%	108	13%	48	14%	71	8%
Shorter waiting times	135	18%	133	16%	62	18%	191	21%
Increased amount/type of equipment	297	39%	234	27%	138	41%	279	31%
More equipment in working order	132	17%	104	12%	52	15%	99	11%
More special programs	92	12%	87	10%	42	12%	89	10%
Lower costs/charges/fees	59	8%	69	8%	31	9%	70	8%
Better location	58	8%	113	13%	35	10%	40	4%
Additional parking	38	5%	161	19%	20	6%	81	9%
Repair/renovation of building	83	11%	95	11%	54	16%	108	12%
Improved cleanliness	97	13%	68	8%	21	6%	46	5%
Better ventilation/acoustics/lighting	68	9%	92	11%	29	9%	136	15%
Childcare available	125	16%	122	14%	48	14%	184	21%
Better customer service	95	12%	76	9%	33	10%	89	10%
Nationally known fitness franchise	96	13%	72	8%	41	12%	77	9%
Additional workout space	139	18%	172	20%	82	24%	144	16%
Other (Please specify)	105	14%	97	11%	30	9%	134	15%
Nothing else would increase my use	66	9%	101	12%	27	8%	107	12%
I am satisfied with this facility	30	4%	62	7%	25	7%	61	7%

Individuals who use only on-installation facilities were also asked for their suggestions (Table 6-8). Twenty-seven percent of on-installation users were satisfied with facilities. Suggestions for improvements were consistent with those made by users of off-installation facilities. Again, a greater variety and amount of equipment (35%), more convenient hours of operation (26%), and

additional workout space (23%) were cited. Twenty-seven percent of females also mentioned childcare availability. Suggested improvements did not differ by service, rank, or duty location (Tables 6-31 to 6-35 in Appendix B).

Table 6-8
Suggested Improvements for On-Installation Facilities
by On-Installation Users

Suggested improvements	n	%
Increased amount/type of equipment available	909	35%
I am satisfied with this facility	692	27%
More convenient hours of operation	662	26%
Additional workout space	595	23%
More equipment in working order	372	14%
Childcare available	359	14%
Shorter waiting times	315	12%
More special programs	287	11%
Better ventilation/acoustics/lighting	279	11%
Repair/renovation of building	249	10%

6B. Military Spouses

Favorite Activities

Military spouses were asked to list the four physical activities in which they participated most frequently. Overall, individuals most frequently participated in walking (49%), running/jogging (27%), aerobics (25%), and weight training (20%). Females preferred walking (54%), aerobics (28%), using exercise equipment (18%), and running/jogging (15%); while males preferred running/jogging (38%), weight training (26%), basketball (18%), walking (18%), and bicycle riding (15%). For Army, Navy, and Marine Corps spouses, the top activities were walking, running/jogging, and aerobics. For Air Force spouses, walking remained the top activity, followed by aerobics, and the use of exercise equipment.

Top 10 Activities for Military Spouses

- | | |
|---------------------------|-----------------------|
| 1. Walking 49% | 6. Bicycle Riding 15% |
| 2. Running/Jogging 27% | 7. Swimming 14% |
| 3. Aerobics 25% | 8. Basketball 9% |
| 4. Weight Training 20% | 9. Gardening 9% |
| 5. Exercise Equipment 19% | 10. Golfing 8% |

Where Spouses Exercise

Military spouses reported using on-installation facilities less frequently than did military members (Table 6-9). Spouses reported that they mainly used on-installation facilities for golf (79%), basketball (72%), weight training (70%), and running/jogging (69%).

Exercise equipment, bicycle riding, walking, and swimming were similar in their percentages of on- versus off-installation participation. Females were more likely to walk (55%) and perform aerobics (58%) off installation, while the remaining top activities were performed primarily on installation. Male spouses used on-installation facilities for most activities.

Table 6-9
Spouse Participation in Sports
by Location of Activity

Sports	Off Installation		On Installation	
	n	%	n	%
Aerobics	449	56%	355	44%
Basketball	80	28%	206	72%
Bicycle riding	264	55%	215	45%
Exercise equipment	269	44%	339	56%
Gardening	227	74%	80	26%
Golfing	53	21%	198	79%
Running/Jogging	267	31%	591	69%
Swimming	207	45%	253	55%
Walking	862	54%	722	46%
Weight training	197	30%	454	70%

Reasons for Not Using On-Installation Facilities

Spouses who used only off-installation facilities were asked why they did not exercise on installation (Table 6-10). Top reasons included: too far to travel (34%), lack of childcare (30%), overcrowding (25%), inconvenient hours of operation (23%), and facility not family oriented (22%).

Twenty-one percent of female spouses indicated that they did not know what programs were available. Eighteen percent reported not having any experience with on-installation facilities. These findings were similar for spouses in all four services (Tables 6-46 to 6-48 in Appendix B).

Table 6-10
Reasons for Not Using On-Installation Facilities by
Users of Off-Installation Facilities by Spouses

Reasons	n	%
Distance is too far to travel	409	34%
Lack of childcare	355	30%
Facility is crowded	303	25%
Hours of operation not convenient	277	23%
Not family oriented	261	22%
Don't know programs are available	221	18%
No experience with facilities	192	16%
Poor customer service	131	11%
Poor quality facilities	133	11%
Other (Please specify)	136	11%
Poor quality equipment	119	10%

Reasons for Not Using Off-Installation Facilities

Spouses who used on-installation facilities were asked why they did not use off-installation facilities and their responses are summarized in Table 6-11. Forty-two percent of spouses indicated that off-installation facilities cost too much. Nearly one-third had no experience with off-installation facilities and 22% stated that the distance is too far to travel. These findings did not vary by gender or service (Tables 6-49 to 6-51 in Appendix B).

Table 6-11
Reasons for not Using Off-Installation Facilities
by Users of On-installation Facilities by Spouses

Reasons	n	%
Cost too much	347	42%
No experience with facilities	261	32%
Distance is too far to travel	179	22%
Don't know programs available	81	10%
Other (Please specify)	82	10%

Reasons for Using Off-Installation Facilities

Spouses were asked their reasons for using off-installation facilities and their responses are summarized in Table 6-12. The majority of respondents indicated convenience as a factor in their choice. Fifty-seven percent cited a more convenient location, while 29% reported more convenient hours of operation, and 22% mentioned available childcare. Females agreed with these three reasons. For males, availability of more modern equipment was most important (53%). Spouses in all four services gave the same reasons in similar order of importance (Tables 6-52 to 6-54 in Appendix B).

Table 6-12
Reasons for Using Off-Installation Facilities by Spouses

Reasons	n	%
More convenient than on-installation facilities	688	57%
More convenient hours of operation	343	29%
Childcare available on site	267	22%
Other (Please specify)	247	21%
More modern equipment and facilities	222	19%
Feel more welcome than on installation	195	16%
Better customer service than on-installation facilities	173	14%
Only facilities/programs available in this area	134	11%

Suggested Improvements for On-Installation Facilities

Spouses who used off-installation facilities were asked what improvements could be made to on-installation facilities to make them more appealing (Table 6-13). Thirty-five percent cited availability of childcare, while 32% wanted more convenient hours of operation. Other top suggestions were an increase in the number and type of equipment (21%), and better advertising/promotion (19%).

Table 6-13
Suggested Improvements for On-Installation Facilities
by Off-Installation Facility Users by Spouses

Suggested improvements	n	%
Childcare available	423	35%
More convenient hours of operation	386	32%
Increased amount/type of equipment available	248	21%
Better advertising and promotion	228	19%
More special programs	182	15%
Lower costs/charges/fees	179	15%
Additional workout space	185	15%
Better location	174	14%
Better customer service	143	12%
Other (Please specify)	132	11%
More equipment in working order	115	10%
Nothing else would increase my/our use	118	10%

In addition to the above, Table 6-14 shows that males mentioned additional workout space (22%) and equipment in working order (19%) as their leading concerns as compared to females who mentioned childcare (40%).

Table 6-14
Suggested Improvements for On-Installation Facilities by
Off-Installation Facility Users by Spouse Gender

Suggested Improvements	Male		Female		
	n	%	n	%	
More convenient hours	76	31%	Childcare available	273	40%
Increased amount/type of equip.	76	31%	More convenient hours of operation	217	32%
Childcare available	64	26%	Better advertising and promotion	131	19%
Additional workout space	53	22%	Lower costs/charges/fees	111	16%
More working equipment	45	19%	Increased amount/type of equipment	109	16%
Better customer service	40	16%	Better location	104	15%
More special programs	37	15%	More special programs	94	14%
Nothing else would increase	35	14%	Other (Please specify)	90	13%
Repair/renovation of building	33	14%	Additional workout space	80	12%
Better advertising and promotion	31	13%	Better customer service	68	10%
Shorter waiting times	25	10%	Nothing else would increase	66	10%

In all four services, available childcare and more convenient hours of operation were the top two suggested improvements made by spouses. Among Army spouses, other top suggestions included increased amount/type of equipment

(26%), more special programs (22%), and better advertising and promotion (21%). Twenty-two percent of Navy spouses cited facility location as a suggested improvement. Marine Corps spouses suggested better advertising and promotion (25%) and increased amount/type of equipment (22%). Likewise, 20% of Air Force spouses suggested increased amount/type of equipment.

Spouses who reported using only on-installation facilities were asked to suggest improvements for their facilities (Table 6-15). Like the users of off-installation facilities, the top suggestions were childcare available (28%), more convenient hours (28%), and increased amount/type of equipment (23%). Females agreed with the overall findings, while males also mentioned additional workout space (25%).

Table 6-15
Suggested Improvements for On-Installation Facilities by On-Installation Users by Spouses

Suggested improvements	n	%
More convenient hours of operation	229	28%
Childcare available	235	28%
Increased amount/type of equipment	187	23%
I am satisfied with this facility	172	21%
Additional workout space	135	16%
More equipment in working order	119	14%
Shorter waiting times	95	12%
Lower costs/charges/fees	95	12%
More special programs	90	11%
More special programs	90	11%
Nothing else would increase use	88	11%

The most frequently suggested improvements by the spouses were consistent across the services; however, Navy spouses (24%) also suggested lower costs. Marine Corps spouses (23%) suggested additional workout space. However, 21% of spouses who used on-installation facilities indicated satisfaction with these facilities, as compared to only 4% of users of off-installation facilities.

6C. Military Children

Activity Preferences

Preschool

Over 80% of all preschool age children reported exercising or participating in active play for at least one hour per day. Over 60% reported exercising more than three hours per day. Overall, that frequency of activity for preschool age children was the same regardless of gender or service.

Grades K-4

The most popular activity for all children in grades K-4 was bicycle riding (27%); soccer (19%), baseball (12%), roller/ice/in-line skating (12%), basketball (10%), and swimming (9%) followed.

Top 5 Activities of Children in Grades K-4

1. Bicycle riding (27%)
2. Soccer (19%)
3. Baseball (12%)
4. Roller/ice/in-line skating (12%)
5. Basketball (10%)

For boys, the top activities were bicycle riding (29%), soccer (24%), baseball (20%), basketball (13%), roller/ice/in-line skating (12%), and football (11%) (Table 6-16). Girls also chose bicycle riding as their primary activity (26%). This was followed by swimming (14%), soccer (12%), roller/ice/in-line skating (11%), gymnastics (11%), and dancing (10%). The only team sport indicated by females was soccer. Due to the small number of respondents in this category, breakdowns by service were not examined.

Table 6-16
Grades K-4 Activities by Gender

Activities	Male		Female	
	n	%	n	%
Baseball	130	20%	11	2%
Basketball	87	13%	31	6%
Bicycle riding	188	29%	134	26%
Dancing	2	0%	50	10%
Football	71	11%	0	0%
Gymnastics	11	2%	58	11%
Roller/ice/in-line skating	79	12%	56	11%
Running/jogging	50	8%	43	8%
Soccer	159	24%	65	12%
Swimming	33	5%	74	14%

Grades 5-8

The most frequently reported activities for children in grades 5-8 were basketball and bicycle riding.

Top 5 Activities of Children in Grades 5-8

1. Basketball (23%)
2. Bicycle riding (22%)
3. Soccer (16%)
4. Roller/ice/in-line skating (15%)
5. Football (8%)

For boys in this age group, basketball (34%) replaced bicycle riding (20%) as the primary activity (Table 6-17). Soccer (16%), skating (16%), football (15%), and baseball (14%) are still top activities. It should be noted that of the top six activities, four are team sports. For girls, bicycle riding (25%) remained the top activity, followed by roller/ice/in-line skating (14%), soccer (14%), swimming (12%), and basketball (11%). Due to the small number of respondents in this category, breakdowns by service were not examined.

Table 6-17
Grades 5-8 Activities by Gender

Activities	Male		Female	
	n	%	n	%
Baseball	58	14%	12	3%
Basketball	138	34%	45	11%
Bicycle riding	81	20%	103	25%
Dancing	0	0%	27	7%
Football	62	15%	0	0%
Roller/ice/in-line skating	66	16%	57	14%
Soccer	67	16%	56	14%
Swimming	29	7%	48	12%
Walking	12	3%	34	8%

Grades 9-12

Only two activities were chosen by 10% or more of the teenagers—basketball (20%) and football (12%).

Top 5 Activities of Teenagers

1. Basketball (20%)
2. Football (12%)
3. Roller/ice/in-line skating (8%)
4. Soccer (9%)
5. Weight training (9%)

As shown in Table 6-18, basketball continues to be the main activity among boys (25%) followed by football (21%), weight training (13%), soccer (10%), and baseball (9%). Among teenage girls, cheerleading is indicated as the top activity in the sample (12%). The largest number of the remaining responses was distributed among eight different activities: basketball (9%), dancing (8%), soccer (8%), softball (7%), bicycle riding (6%), skating (6%), swimming (6%), and volleyball (6%). Due to the small number of respondents in this category, breakdowns by service were not examined.

Table 6-18
Teenage Activities by Gender

Activities	Male		Female	
	n	%	n	%
Baseball	29	9%	7	3%
Basketball	77	25%	20	9%
Bicycle riding	10	3%	14	6%
Cheerleading	4	1%	28	12%
Dancing	0	0%	19	8%
Football	64	21%	0	0%
Roller/ice/in-line skating	24	8%	13	6%
Running/jogging	29	9%	10	4%
Soccer	30	10%	19	8%
Softball	0	0%	17	7%
Swimming	10	3%	15	6%
Volleyball	3	1%	13	6%
Weight training	40	13%	8	3%

Where Children Exercise

Grades K-4

Of the activities listed for children in grades K-4, bicycle riding and roller/ice/in-line skating were primarily off installation (Table 6-19). The remaining top activities were conducted almost equally on and off installation.

Table 6-19
Grades K-4 Activities by Location of Activity

Activities	Off Installation		On Installation	
	n	%	n	%
Baseball	61	44%	78	56%
Basketball	59	50%	60	50%
Bicycle riding	214	67%	106	33%
Roller/ice/in-line skating	90	65%	48	35%
Soccer	108	48%	117	52%
Swimming	51	47%	57	53%

There were few differences among boys and girls in regard to where they performed activities (Table 6-20). Males were more likely to participate in roller/ice/in-line skating (43% vs. 23% of females), swimming (59% vs. 51% of females) and walking (37% vs. 3% of females) on installation.

**Table 6-20
Grades K-4 Activities by Location of Activity by Gender**

Activities	Males				Females			
	Off Installation		On Installation		Off Installation		On Installation	
	n	%	n	%	n	%	n	%
Baseball	57	45%	70	55%	4	36%	7	64%
Basketball	47	55%	39	45%	11	34%	21	66%
Bicycle riding	130	70%	57	30%	82	63%	49	37%
Dancing	2	100%	0	0%	46	92%	4	8%
Football	52	73%	19	27%	0	0%	0	0%
Gymnastics	8	73%	3	27%	42	71%	17	29%
Roller/ice/in-line skating	45	57%	34	43%	44	77%	13	23%
Running/jogging	32	67%	16	33%	26	59%	18	41%
Soccer	76	48%	82	52%	30	46%	35	54%
Softball	1	100%	0	0%	8	80%	2	20%
Swimming	13	41%	19	59%	36	49%	37	51%
Walking	5	63%	3	37%	38	97%	1	3%

Grades 5-8

For children in grades 5-8, four of the top five activities—basketball, bicycle riding, football, and soccer—were performed off installation more often than on installation (Table 6-21). Only roller/ice/in-line skating activities occurred somewhat equally on and off installation. The majority of boys and girls participated in these activities off installation.

**Table 6-21
Grades 5-8 Activities by Location of Activities**

Activities	Off Installation		On Installation	
	n	%	n	%
Basketball	103	57%	79	43%
Bicycle riding	114	62%	70	38%
Football	46	71%	19	29%
Roller/ice/in-line skating	67	54%	58	46%
Soccer	77	60%	51	40%

Grades 9-12

For teenagers in grades 9-12, the majority of activities (59% to 95%) were performed off installation (Table 6-22).

Table 6-22
Teenage Activities by Location of Activities

Activities	Off Installation		On Installation	
	n	%	n	%
Basketball	58	59%	41	41%
Football	61	95%	3	5%
Roller/ice/in-line skating	26	70%	11	30%
Soccer	37	76%	12	24%
Weight training	37	79%	10	21%

Teenage girls were more likely to participate in baseball and roller/ice/in-line skating on installation (Table 6-23). Boys were more likely to participate in basketball, bicycle riding, and weight training on installation.

Table 6-23
Teenage Activities by Location of Activities by Gender

Male	Off Installation		On Installation		Female	Off Installation		On Installation	
	n	%	n	%		n	%	n	%
Baseball	24	80%	6	20%	Baseball	2	33%	4	67%
Basketball	40	53%	36	47%	Basketball	16	76%	5	24%
Bicycle riding	5	50%	5	50%	Bicycle riding	14	100%	0	0%
Football	60	95%	3	5%	Football	0	0%	0	0%
Cheerleading	0	0%	0	0%	Cheerleading	23	82%	5	18%
Roller/ice/in-line skating	18	75%	6	25%	Roller/ice/in-line skating	9	64%	5	36%
Running/jogging	18	60%	12	40%	Running/jogging	7	70%	3	30%
Soccer	21	70%	9	30%	Soccer	15	83%	3	17%
Softball	0	0%	0	0%	Softball	8	50%	8	50%
Swimming	0	0%	10	100%	Swimming	7	47%	8	53%
Volleyball	3	100%	0	0%	Volleyball	12	92%	1	8%
Weight training	28	74%	10	26%	Weight training	8	100%	0	0%

6D. Discussion

Military Members

Trends indicate that the popularity of leisure activities has increased (Surgeon General's Report, 1996; Healthy People 2000, 1990). Individuals are more likely to initiate and maintain an exercise program if they choose activities that they enjoy. Activity preferences are highly individual and may vary according to gender. The DoD would do well to develop programs that appeal to the interests of both men and women.

Overall, the most frequently reported activity for military members was running/jogging. This was consistent across the services. The top four activities reported also included weight training, basketball, and walking. However, there were differences when the sample was separated by gender. While running/jogging was the most frequently reported activity for both male and female military members, the top four activities for females also included aerobics and use of exercise equipment.

Findings were consistent with data from the *1996 MWR Army Leisure Needs Survey*. Running/jogging was also the most frequently reported activity of military members, and similar proportions participated in weight training, exercise equipment and basketball. Results were also consistent with data from the *1995 Quality of Life in the Marine Corps Survey*, in which running was the most frequently reported activity. According to the *1991 NHIS Survey*, the overall top three activities for civilians, between the ages of 18-44, were walking, stretching exercises, and gardening or yard work. Differences in activity preferences between military members and civilians reflect higher intensity (moderate to vigorous activity) preferences by military personnel.

Military Spouses

Overall, walking was the most frequently reported activity for military spouses. This was consistent across the services and comparable to civilian data (Surgeon General's Report, 1996; Healthy People 2000, 1990). The top four activities for military spouses also included running/jogging, aerobics, and weight training. Findings were similar to activity preferences reported by spouses in the *1996 Army Leisure Needs Survey*. When separated by gender, the most frequently reported activity of female spouses was walking. The most frequently reported activity for male spouses was running/jogging.

Location

Military members exercised on installation more often than off installation. Findings were consistent for gender and between the services. Fewer military spouses reported utilizing on-installation facilities compared to military members. Therefore, it is important that activity preferences be taken into consideration when developing on-installation fitness programs. In order to increase utilization of on-installation facilities by female spouses, more programs such as aerobics and walking programs could be offered.

Although most military members used on-installation facilities, those who did not reported that facilities were overcrowded, had inconvenient hours of operation, and were too distant to travel. Army and Marine Corps members often reported poor quality facilities and equipment. Reasons for not using on-installation facilities more often differed from data reported in the *1996 Army Leisure Needs Survey*. The most frequently reported reasons given by Army personnel and spouses were lack of interest, lack of free time, to get away from the military environment, and unaware of available programs (U.S. Army Community and Family Support Center, 1996).

Suggested improvements included more convenient hours of operation, and greater/more types of available equipment. Members who did use on-installation facilities made the same suggested improvements. Twenty-three percent of this group also cited a need for additional workout space. Of members who did not use off-installation facilities, more than half reported that it was cost prohibitive. Other top reasons were no experience with off-installation facilities and a distance too far to travel.

Military spouses who used off-installation facilities noted that on-installation facilities were too far to travel, were overcrowded, and lacked childcare. Suggested improvements for on-installation facilities included available childcare, more convenient location, and more convenient hours. Users of on-installation facilities were most likely to suggest availability of childcare, more convenient hours, and increased amount of equipment.

Like military members, spouses often found off-installation facilities to be too expensive. Additionally, they stated that facilities were often too far away, and that they were unaware of programs offered.

Military Children

The most popular activities of young children in grades K-4 were bicycle riding, soccer, and baseball. Girls were less likely to be involved in team sports than boys. For children in this age group, most activities were done equally on and off installation. However, girls were more likely to participate in activities on installation than were boys.

The most popular activities of children in grades 5-8 were basketball, bicycle riding, and soccer. When separated by gender, the top 3 activities reported by girls were bicycle riding, roller/in-line skating, and soccer. For children in this age group, four of the top five activities were more likely to be performed off installation than on installation.

The most popular teenage activities were basketball and football. Activity preferences among teenagers differed by gender. The most popular activities for teenage girls were cheerleading, basketball, and dancing. Teenagers were also more likely to participate in physical activities off installation.

Activity preferences of military children were similar to civilian children surveyed in the 1992 NHIS-YRBS (*National Health Interview Survey-Youth Risk Behavior Survey*). Similarly, the most popular activities reported by those youth between the ages of 12-21 were basketball, football, soccer, aerobics or dancing, and baseball (Surgeon General's Report, 1996; Healthy People 2000, 1990). Results suggest that team sports, such as basketball and soccer, were very popular activities of children in all age groups. Male children played more team sports as they got older. Team sports should be encouraged, especially for girls. On-installation physical activity program participation could be increased by offering more team sports, such as football, soccer, basketball, and softball for boys and girls of all age groups.

6E. Summary and Implications

Military Members

- The majority of military members both CONUS and OCONUS regularly used on-installation facilities.
- Reasons for using off-installation facilities included location, convenient hours, and more modern equipment.
- Military members were satisfied with the overall quality of fitness services.

Implications

Suggested improvements to increase use of on-installation facilities: more convenient hours of operation, additional work-out space, greater variety and amount of equipment.

Military Spouses

- Spouses used on-installation facilities much less frequently than did military members.
- Many female spouses were not aware of facilities and programs available on installation.
- Providing childcare was mentioned by both male and female spouses as an improvement that would increase on-installation participation.
- Spouses who did not use on-installation facilities cited as reasons: distance, lack of childcare, and overcrowding.

Implications

Suggestions to attract spouses to on-installation facilities included: increase childcare services, special programs for women, improved or more convenient hours of operation, and more family oriented facilities.

Developing special advertising directed at spouses—particularly female spouses, informing them of the services, programs, and equipment available to them could help increase spouse physical activity levels.

Military Children

- Children used on-installation facilities less often than did spouses or military members.
- Older boys were increasingly likely to be involved in team sports. Girls tended to continue with individual aerobic activities such as swimming, skating, bicycle riding, and dancing. These are aerobic activities suggested by the American Academy of Pediatrics (Surgeon General's Report, 1996).
- Basketball and soccer were very popular with male and female children of all grade levels.

Implications

Individual lifetime activities that emphasize aerobic exercise (bicycling, swimming, tennis, and running) should be encouraged for girls and boys of all ages and supported by providing on-installation facilities.

On-installation physical activity participation could be increased by offering team sports (football, soccer, basketball, volleyball, and softball) for boys and girls of all ages.

Satisfaction with Facilities

7A. Military Members

Satisfaction with On-Installation Physical Activity Facilities

Table 7-1 shows responses of military members when asked to rate the quality of available on-installation physical activity facilities (i.e., buildings, equipment and furnishings, personnel, and overall quality of services). Forty-five percent rated the quality of physical activity buildings/facilities on their installation as good or very good. Eighty-two percent found the buildings to be at least adequate. Only 12% rated buildings/facilities as poor or very poor. These responses were consistent regardless of gender, rank, and duty location (Tables 7-1 to 7-5 in Appendix B).

Table 7-1
Military Member Satisfaction
with Buildings and Facilities

Satisfaction	n	%
Very good	1,282	15%
Good	2,553	30%
Adequate/ok	3,144	37%
Poor	767	9%
Very poor	221	3%
Don't know/not sure	536	6%

More Army (14%) and Marine Corps (15%) respondents rated buildings as poor or very poor as compared to Navy (10%) and Air Force (10%). Eight percent of Air Force members answered don't know. This suggests that they may not have used the facilities (Table 7-2).

Table 7-2
Military Member Satisfaction with Buildings and Facilities by Service

Satisfaction	Army		Navy		Marine Corps		Air Force	
	n	%	n	%	n	%	n	%
Very good	294	12%	389	17%	160	14%	420	16%
Good	684	29%	737	32%	332	30%	787	30%
Adequate/ok	964	40%	814	35%	411	37%	941	36%
Poor	237	10%	178	8%	130	12%	215	8%
Very poor	89	4%	41	2%	29	3%	60	2%
Don't know/not sure	121	5%	142	6%	50	4%	220	8%

Nearly half (47%) of all respondents reported that the quality of equipment and furnishings were either good or very good (Table 7-3). Eighty-two percent found equipment and furnishings to be at least adequate. These findings were consistent for gender, rank, and for members stationed both CONUS and OCONUS (Tables 7-6 to 7-10 in Appendix B).

Table 7-3
Military Member Satisfaction with
Quality of Equipment and
Furnishings

Satisfaction	n	%
Very good	1,151	14%
Good	2,782	33%
Adequate/ok	3,000	35%
Poor	770	9%
Very poor	199	2%
Don't know/not sure	600	7%

Table 7-4 shows that more Army members (15%) rated the quality of furnishings as poor or very poor, compared to Navy (9%), Marine Corps (12%), and Air Force (10%). Eleven percent of Air Force members answered don't know. Again this suggests that these military members may not have used the existing facilities.

Table 7-4
Military Member Satisfaction with Quality of Equipment and Furnishings by Service

Satisfaction	Army		Navy		Marine Corps		Air Force	
	n	%	n	%	n	%	n	%
Very good	278	12%	342	15%	153	14%	362	14%
Good	716	30%	823	36%	358	32%	868	33%
Adequate/ok	902	38%	763	33%	420	38%	903	34%
Poor	273	11%	170	7%	111	10%	210	8%
Very poor	91	4%	43	2%	21	2%	42	2%
Don't know/not sure	131	5%	163	7%	50	4%	254	11%

Overall, fewer members (39%) rated the quality of personnel as good or very good (Table 7-5). Fourteen percent rated personnel as poor or very poor, 35% rated them as adequate, and 12% said they did not know.

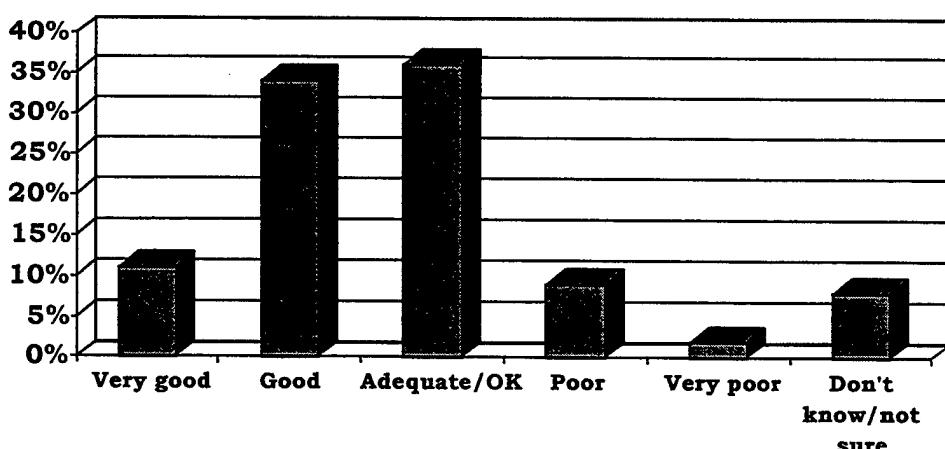
Table 7-5
Military Member Satisfaction
with Quality of Personnel

Satisfaction	n	%
Very good	843	10%
Good	2,467	29%
Adequate/ok	2,959	35%
Poor	930	11%
Very poor	234	3%
Don't know/not sure	1,058	12%

Males (15%) were more likely than females (11%) to rate the quality of personnel as poor or very poor. Fourteen percent of females and 12% of males answered don't know when asked to rate the quality of personnel. Army members were most likely (16%) to rate personnel as poor or very poor, followed by the Marine Corps (14%), Navy (13%), and Air Force (12%). Sixteen percent of Air Force and 13% of Navy respondents answered with don't know. There was no difference noted between officers and enlisted personnel or members stationed CONUS or OCONUS (Tables 7-11 to 7-15 in Appendix B).

Fitness services as a whole were rated as good or very good by 45% of the members, while 11% rated the quality as poor or very poor (Figure 7-1). Eighty-one percent believed that fitness facilities were at least adequate.

Figure 7-1
Military Member Satisfaction with
Quality of Physical Activity Services



These findings were consistent by gender, duty location, and among the Navy, Marine Corps, and Air Force. Army personnel were less satisfied, with only 40% rating overall quality of facilities as good or very good, and 15% rating overall quality of services as poor or very poor (Table 7-6).

Table 7-6
Military Member Satisfaction with Quality of Physical Activity Services by Service

Satisfaction	Army		Navy		Marine Corps		Air Force	
	n	%	n	%	n	%	n	%
Very good	225	9%	274	12%	133	12%	304	12%
Good	748	31%	825	36%	385	35%	937	36%
Adequate/ok	914	38%	836	36%	420	38%	866	33%
Poor	291	12%	160	7%	99	9%	211	8%
Very poor	70	3%	33	1%	19	2%	47	2%
Don't know/not sure	140	7%	177	8%	56	4%	273	9%

Which members are most satisfied?

- Air Force (32%) and Navy (29%)
- Married with children (42%)
- Less than 30 years old (50%)
- Less than a two year degree in college (67%)
- Live in a privately owned home (53%)

Most Valued Facilities/Programs

Military members were asked to choose the three facilities/programs they found to be most important (Table 7-7). By far, most respondents (63%) reported fitness centers as their most valued facilities. In addition, more than one third of the respondents valued swimming pools and gymnasiums.

Table 7-7
Military Member Ranking of
Most Valued Facilities/Programs

Facilities	n	%
Fitness center	5,486	63%
Swimming pools	3,144	36%
Gymnasium	3,039	35%
Running track	2,313	27%
Fitness trails	1,820	21%
Bike path	1,730	20%
Intramural sports	1,515	18%
Golf course	1,506	17%
Bowling center	1,504	17%
Recreational equipment	1,453	17%
Playing fields	1,389	16%
Playing courts	1,282	15%

Seventy-two percent of females chose the fitness center as one of the three most valuable facilities (Table 7-8). Swimming pools were second most important (42%), followed by running tracks (38%). Males also valued fitness centers (63%) and swimming pools (35%), but included gymnasiums (36%) as one of their top three choices.

Table 7-8
Military Member Ranking of
Most Valued Facilities/Programs by Gender

Facilities/Programs	Male		Female	
	n	%	n	%
Bike path	1167	20%	306	23%
Bowling center	1031	17%	247	19%
Fitness center	3723	63%	958	72%
Fitness trails	1203	20%	347	26%
Golf course	1185	20%	97	7%
Gymnasium	2161	36%	390	29%
Intramural sports	1176	20%	158	12%
Playing courts	960	16%	142	11%
Playing fields	1078	18%	110	8%
Recreational equipment rental	1018	17%	210	16%
Running track	1457	25%	501	38%
Swimming pools	2095	35%	553	42%

The same general patterns were found within the rank group. However, some differences were noted among officers and enlisted personnel. Officers more so than enlisted personnel viewed fitness centers (70% vs. 62%), golf courses (27% vs. 15%), and fitness trails (29% vs. 19%) as more important. Conversely, enlisted personnel viewed gymnasiums (37% vs. 30% of officers) and bowling centers (20% vs. 6% of officers) as more important. There was little difference among the four military services and duty locations (Tables 7-21 to 7-25 in Appendix B).

Least Valued Facilities/Programs

More than one third of respondents identified golf courses (49%), sports above the intramural level (43%), bike paths (37%), and bowling centers (34%) as the least valued programs/facilities (Table 7-9).

Table 7-9
Military Member Ranking of
Least Valued Facilities/Programs

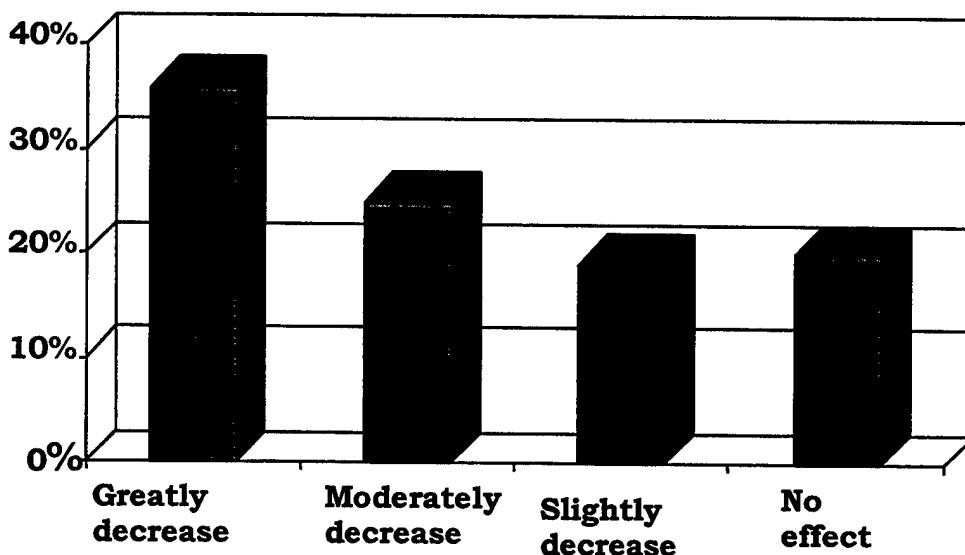
Facilities/Programs	n	%
Golf course	4,229	49%
Sports above intramural level	3,706	43%
Bike path	3,201	37%
Bowling center	2,985	34%
Fitness trails	2,077	24%
Running track	1,692	20%
Recreational equipment	1,516	18%
Intramural sports	1,437	17%
Swimming pools	1,043	12%
Playing courts	1,018	12%
Playing fields	847	10%

The same general pattern was found for both officers and enlisted personnel. However, some differences were noted between the two. Officers viewed bowling centers (48% vs. 32% of enlisted personnel) and sports above the intramural level (59% vs. 40%) as less important, while enlisted personnel viewed golf courses (52% vs. 34% of officers), fitness trails (26% vs. 17%) and bike paths (39% vs. 28%) as least important. These results were consistent among all four military services, both CONUS and OCONUS, as well as among both males and females.

Quality of Life Without On-Installation Facilities

Respondents were asked how their quality of life would be affected if on-installation physical activity facilities/programs were not available (Figure 7-2). Eighty percent of respondents said that their quality of life would at least slightly decrease. More than one-third thought that quality of life would decrease greatly.

Figure 7-2
**Military Members Rating of Impact on Quality of Life
Without Fitness Facilities**



The loss of these facilities would have an even greater impact on the lives of OCONUS personnel. Forty-two percent of OCONUS respondents maintained that loss of these facilities would greatly decrease their quality of life.

As shown in Table 7-10, most members (76% to 84%) of all services indicated that their quality of life would decrease without fitness facilities. However, Navy (23%) and Air Force (24%) members were most likely to report that loss of facilities would have no effect on their quality of life. No noticeable differences were found in relation to rank (Tables 7-31 to 7-35 in Appendix B).

Table 7-10
Military Members Rating of Impact on Quality of Life
Without Fitness Facilities by Service

Impact	Army		Navy		Marine Corps		Air Force	
	n	%	n	%	n	%	n	%
Greatly decrease	863	36%	742	32%	452	41%	960	36%
Moderately decrease	680	28%	565	24%	273	24%	581	22%
Slightly decrease	416	17%	480	21%	212	19%	471	18%
No effect	428	17%	529	23%	178	16%	628	24%

7B. Spouses

Satisfaction with On-Installation Physical Activity Facilities

Spouses of military members were asked to rate the quality of four aspects of their fitness facilities: buildings, equipment and furnishings, personnel, and overall quality. Military spouses were much less satisfied with the quality of fitness buildings and facilities than were military members (Table 7-11). Only 18% of the spouses reported them as being either good or very good, compared to 45% of the military members. Twenty-four percent of spouses reported their fitness buildings as being poor or very poor. Twenty-six percent answered don't know. This large percentage indicates that spouses may have little experience with these facilities.

Table 7-11
Spouse Satisfaction with Quality
of Building and Facilities

Satisfaction	n	%
Very good	445	13%
Good	188	5%
Adequate/ok	1,138	32%
Poor	95	3%
Very poor	725	21%
Don't know /not sure	926	26%

The largest percentage of female spouses (32%) reported don't know/not sure about the quality of the facilities (Table 7-12). This percentage was notably higher than males (14%) and indicates that female spouses may have less experience with installation facilities. For male spouses, 40% viewed the quality of buildings as only adequate, compared to 28% of female spouses. Across all four military services, no appreciable differences were found (Tables 7-36 to 7-38 in Appendix B).

Table 7-12
Spouse Satisfaction with Quality
of Buildings and Facilities by Gender

Satisfaction	Male		Female	
	n	%	n	%
Very good	102	13%	231	12%
Good	63	8%	85	4%
Adequate/ok	307	40%	556	28%
Poor	23	3%	54	3%
Very poor	171	22%	414	21%
Don't know /not sure	96	14%	616	32%

When asked to rate the quality of equipment and furnishings in their facilities, 16% of spouses rated equipment and furnishings as being good or very good, as compared to 47% of military members (Table 7-13). Twenty-one percent of the spouses reported them as very poor, versus 2% of the military members. Twenty-eight percent of spouses were not able to give an opinion about the quality of equipment and furnishings. Female spouses (32%) were more likely than males (14%) to report they did not know/or weren't sure. Across services, no differences were found (Tables 7-39 to 7-41 in Appendix B).

Table 7-13
Spouse Satisfaction with Quality of Equipment/Furnishings

Satisfaction	n	%
Very good	393	11%
Good	193	5%
Adequate/ok	1,176	33%
Poor	70	2%
Very poor	726	21%
Don't know /not sure	957	28%

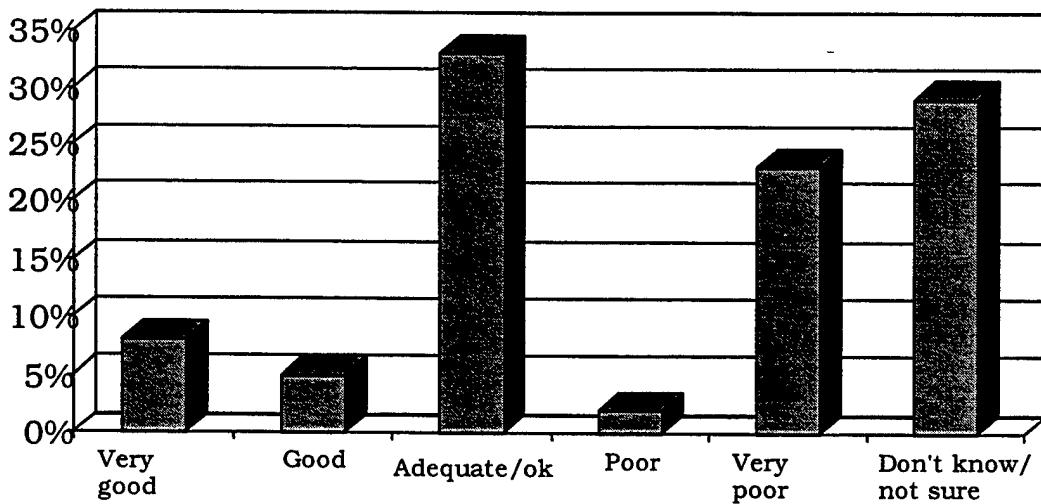
Spouses were next asked to rate the quality of personnel operating their fitness facilities (Table 7-14). Fourteen percent reported the quality of facility personnel as being good or very good, as compared to 39% of the military members. Twenty-two percent reported personnel as being very poor, as compared to 3% of members. More than one-third chose don't know/not sure. As seen in other areas, this may indicate that spouses were unfamiliar with the facilities and personnel.

Few differences were found among gender. Females did, however, report a higher percentage of not knowing about the facilities (40%), as compared to males (21%). Across services, Navy and Air Force spouses were more likely to choose don't know/not sure (37% each), as compared to Army (30%) and Marine Corps (34%).

Table 7-14
Spouse Satisfaction with Quality of Personnel

Satisfaction	n	%
Very good	273	8%
Good	226	6%
Adequate/ok	943	27%
Poor	108	3%
Very poor	763	22%
Don't know /not sure	1,211	34%

Figure 7-3
**Spousal Satisfaction with Overall Quality of
Physical Activity Services**



Physical activity services as a whole were also rated lower by spouses (Figure 7-3). Twenty-three percent of the spouses rated the overall quality of physical activity services as very poor. Twenty-nine percent responded with don't know.

Thirteen percent of both male and female spouses rated physical activity services as good or very good, as compared to 46% of the members (Table 7-15). However, more male spouses (28%) than female spouses (22%) rated overall quality as very poor. One-third of the female spouses chose don't know, as opposed to 16% of male spouses.

Table 7-15
**Spousal Satisfaction with Overall Quality of
Physical Activity Services Available On Installation by Gender**

Satisfaction	Male		Female	
	n	%	n	%
Very good	56	7%	156	8%
Good	47	6%	94	5%
Adequate/ok	315	41%	578	29%
Poor	19	2%	38	2%
Very poor	216	28%	431	22%
Don't know /not sure	122	16%	670	34%

Across services, 28% of Marine Corps spouses rated facility services as very poor, compared to 21% of Army and Navy, and 23% of Air Force. More Navy spouses (35%) chose don't know, as compared to 24% Army, 28% Marine Corps, and 30% Air Force spouses.

Which spouses are most satisfied?

- Air Force (39%) and Army (28%) spouses
- Age 35 or younger (64%)
- Attained a 2 year college degree or less (52%)
- Live in a large (34%) or medium-sized (22%) city

Most Valued Facilities/Programs

When asked which three physical activity facilities/programs were of most value to military spouses, 57% chose fitness centers (Table 7-16). Forty-two percent chose swimming pools, followed by bowling centers (29%). Males (25%) also chose gymnasiums as one of the most valued facilities. There were no differences among services (Tables 7-48 to 7-50 in Appendix B).

Table 7-16
Spouse Ranking of Most Popular
Facilities/Programs

Facilities/Programs	n	%
Fitness center	2136	57%
Swimming pools	1589	42%
Bowling center	1092	29%
Outdoor recreation areas	853	23%
Gymnasium	776	21%
Fitness trails	700	19%
Running track	689	18%
Community recreation center	660	17%
Bike path	644	17%
Golf course	551	15%
Recreation equipment rental	561	15%

Least Valued Facilities/Programs

Spouses were asked which physical activity facilities/programs they found to be least important (Table 7-17). The least valued facilities were golf courses (46%), sports above intramural level (44%), and in-line skate paths (44%). Spouses agreed with military members on golf courses and sports above the intramural level.

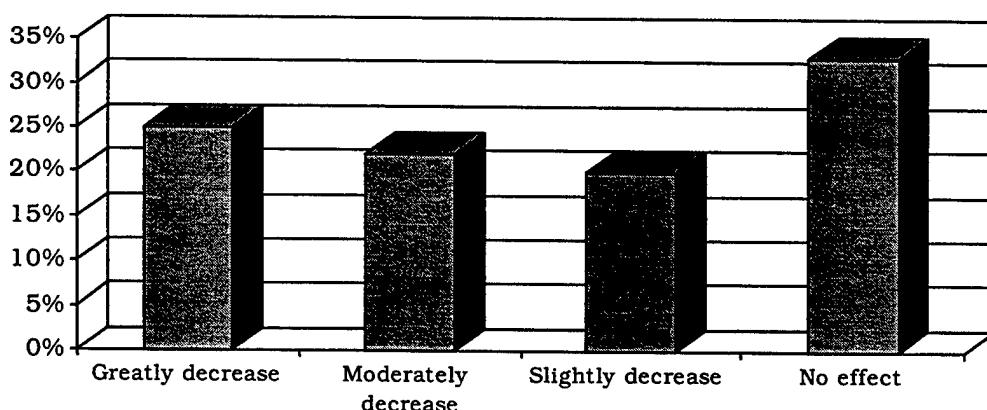
Table 7-17
Spouse Ranking of
Least Favorite Facilities/Programs

Facilities/Programs	n	%
Golf course	1724	46%
Sports above intramural level	1664	44%
In-line skate path	1647	44%
Bowling center	848	22%
Intramural sports	799	21%
Running track	571	15%
Playing courts	452	12%
Fitness trails	457	12%
Bike path	435	12%
Community recreation center	429	11%
Recreation equipment rental	414	11%
Playing fields	378	10%

Quality of Life Without On-Installation Facilities

Sixty-seven percent of spouses thought that their quality of life would decrease if facilities were not available, compared to 80% of the military members (Figure 7-4). Nearly half (47%) reported that a loss of these facilities would either moderately or greatly decrease their quality of life. Over one-third of spouses reported that it would have no effect on their quality of life.

Figure 7-4
Spouse Rating of Impact on Quality of Life
Without Fitness Facilities



Fifty-three percent of male spouses and 43% of female spouses indicated that without facilities they would experience a moderate or great decrease in their quality of life. Twenty-five percent of the male and 37% of the female spouses reported that there would be no effect on their quality of life.

A higher percentage of male spouses (75%) reported that their quality of life would at least slightly decrease as compared to 63% of female spouses (Table 7-18).

Table 7-18
Spouse Rating of Impact on Quality of Life
Without Fitness Facilities by Gender

Impact	Male		Female	
	n	%	n	%
Greatly decrease	235	30%	441	22%
Moderately decrease	178	23%	418	21%
Slightly decrease	168	22%	386	20%
No effect	196	25%	732	37%

Seventy-two percent of Army, 62% of Navy, 67% of Marine Corps, and 64% of Air Force spouses reported that their quality of life would be at least slightly decreased by a loss of physical activity facilities (Table 7-19).

Table 7-19
Spouse Rating of Impact on Quality of Life
Without Fitness Facilities by Service

Impact	Army		Navy		Marine Corps		Air Force	
	n	%	n	%	n	%	n	%
Greatly decrease	247	27%	213	23%	87	25%	252	23%
Moderately decrease	212	23%	196	21%	82	23%	234	21%
Slightly decrease	200	22%	170	18%	67	19%	220	20%
No effect	248	28%	350	38%	116	33%	401	36%

7C. Discussion

Fitness facilities have been shown to be important to the quality of life of military members and their families. In the *1995 Survey of Army Families III*, 63% of spouses rated fitness centers as one of the most important of all MWR programs (Army Personnel Survey Office, U.S. Army Research Institute, 1996). The results of the present study showed that the majority of military personnel exercised on installation. Because of the importance of these programs and facilities, the DoD was interested in determining the quality of available facilities. The DoD was also interested in determining which programs and facilities were most valued by military members and their families.

Military members and their spouses differed in their perceptions regarding the adequacy of fitness facilities, equipment, and personnel. Three quarters or more of military members rated fitness buildings, facilities, equipment, and personnel as adequate or better. In contrast, approximately 50% of spouses were either unsure of the programs/facilities available to them or rated them as poor to very poor. Findings suggest that the majority of military personnel are satisfied with fitness facilities, equipment, and personnel; but many spouses are either unsure of what is available to them or are not satisfied with the current facilities.

The *1996 Army Leisure Needs Survey* found that 88% of active duty members and 91% of their spouses rated the overall quality of post facilities as good/very good or adequate/ok. Over 87% of Army personnel surveyed rated the quality of recreation facilities, equipment, and personnel as adequate to very good (*Army Leisure Needs Survey*, 1996). In the *1994 Navy Community Needs Assessment*, over three-quarters of active duty personnel and their spouses reported that they were satisfied with fitness activities.

Of the facilities and programs available, military members ranked fitness centers, swimming pools, and gymnasiums as the most valuable. Golf courses, sports above intramural level, bike paths, and bowling centers were ranked as least important. Spouses, like members, rated fitness centers and swimming pools as most valuable, with bowling centers ranking third. Golf courses, sports above intramural level, and in-line skate paths were least valued by this group. The findings of the *1996 Army Leisure Needs Survey* were similar in that fitness centers, gymnasium/playing courts/fields, and swimming pools were also rated the most desired MWR programs. Golf courses, sports above intramural level, and bowling centers were rated the least desirable MWR programs by Army personnel and their spouses (*Army Leisure Needs Survey*, 1996).

Eighty percent of members and 67% of spouses reported that they would experience a decrease in their quality of life if physical activity facilities were not available to them. The unavailability of facilities would have a greater impact on OCONUS personnel and their families. Forty-two percent of these individuals indicated that their quality of life would be greatly decreased without physical activity facilities.

Findings suggest that both military members and their families value on-installation fitness facilities, and that elimination of recreation programs would decrease their quality of life. Results were comparable to data from the *1996 Army Leisure Needs Survey*. Seventy-four percent of members and 64% of spouses indicated that their quality of life would decrease if post recreation programs were eliminated (*Army Leisure Needs Survey, 1996*).

7D. Summary and Implications

Military Members

- Fitness centers, swimming pools, and gyms were the most valued facilities.
- Least valued facilities and programs were golf courses, sports above the intramural (IM) level, and bowling centers.
- All military members were less satisfied with the quality of facility personnel as compared to the quality of buildings, furnishings, and equipment.
- The majority of military members felt that their quality of life would moderately or greatly decrease if facilities were not available.

Implications

In-service programs or training to improve the quality of fitness facility staff could help to increase satisfaction with facilities by military members.

When considering new facilities, fitness centers, gymnasiums, and swimming pools could be considered.

Fitness facilities were rated as being extremely beneficial to the quality of life for military members.

Military Spouses

- Spouses were much less satisfied with the quality of on-installation facilities than were military members.
- Fitness centers and swimming pools were chosen by both female and male spouses as the top two most valued facilities or programs.
- Females rated bowling centers and males rated gyms as the third most valued facility.
- Least valued programs and facilities were golf courses, sports above intramural level, and skate paths.
- Spouses were much less satisfied with all aspects of fitness facilities and programs than were members.
- Spouses were much more likely to answer don't know/not sure when asked to rate the quality of facilities and programs.

Implications

Installations could conduct individual satisfaction surveys of spouses to determine their levels of satisfaction and specific areas for improvement.

Installations could develop public relations campaigns and programs to inform spouses of the range and quality of facilities and programs available on installation.

References

- Army Personnel Survey Office, U.S. Army Research Institute. (1996). 1995 Survey of Army families III. Alexandria, VA: U.S. Army Community and Family Support Center.
- Baecke, J., Burema, J. & Fritjers, J. (1982). A short questionnaire for the measurement of habitual physical activity in epidemiological studies. The Journal of Clinical Nutrition, 36, Nov., 936-942.
- Bray, R. M., Kroutil, L. A., Wheless, S. C., Marsden, M. E., Bailey, S. L., Fairbank, J.A. & Harford, T.C. (1995). 1995 Department of Defense survey of health related behaviors among military personnel. Research Triangle Park, NC: Research Triangle Institute.
- Brownell, K. D. & Fairburn, C. G. (Eds.). (1995). Eating disorders and obesity: A comprehensive handbook. New York, NY: Guilford Press.
- Defense Manpower Data Center. (1997). Profile of the military community: 1997 Demographics. Arlington, VA: Military Family Resource Center.
- Dillman, D. (1978). Mail and telephone surveys: The total design method. New York: John Wiley.
- Institute of Medicine. (1990). Healthy people 2000: Citizens chart the course. Soto, M. A., Behrens, R. & Rosemont, C., (Eds.). Washington, DC: National Academy Press.
- Kerce, E. W. (1995). Quality of life in the U.S. Marine Corps. San Diego: Navy Personnel Research and Development Center.
- Levine, A. M., & Dougherty, L. M. (1997). The health and nutrition of children in military families. Scranton, PA: Military Family Institute, Marywood University.
- McArdle, W. D., Katch, F. I. & Katch, V. L. (1996). Exercise physiology: Energy, nutrition, and human performance. (4th ed.) Baltimore, MD: Williams and Wilkins.
- National Heart, Lung, and Blood Institute (NHLBI). (1998). Clinical guidelines on overweight and obesity. (On-line). Available: http://www.nhlbi.nih.gov/nhlbi/cardio/obes/prof/guide.lns/ob_home.htm.
- National Institutes of Health (1998). Clinical guidelines on treating overweight and obesity now available (Summer 1998). Weight-controlled Information Network (WIN). Bethesda, MdP: Author.
- Paffenbarger, R. S., Blair, S. N., Lee, I. M. & Hyde, R. T. (1993). Measurement of physical activity to assess health effects in free-living populations. Medicine and Science in Sports and Exercise, 25(1), 60-70.
- Quarrie, B. P. (1989). Air Force weight and fitness programs. Maxwell Air Force Base, Alabama: Air University, U.S. Air Force.

Sallis, J.F., Patterson, T. L., McKenzie, T. L. & Nader, P.R. (1988). Family variables and physical activity in pre-school children. Developmental and Behavioral Pediatrics, 9(2), 57-60.

U.S. Army Community and Family Support Center. (1996). Triennial needs assessment: 1996 Leisure needs survey. Fairfax, VA: Caliber Associates.

U.S. Department of Health and Human Services. (1996). Physical activity and health: A report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention.

United States Navy CONUS. (1994). U.S. Navy community needs assessment Vol. 2: Detailed summary of needs. University of North Carolina at Chapel Hill: Human Services Research and Design Laboratory.

Bibliography

Ainsworth, B. E., Haskell, W. L., Leon, A. S., Jacobs, D. R., Montoye, H. J., Sallis, J. F. & Paffenbarger, R. S. (1993). Compendium of physical activities: Classification of energy costs of human physical activities. Medicine and Science in Sports and Exercise, 25(1), 71-80.

Ainsworth, B. E., Jacobs, D. R. & Leon, A. S. (1993). Validity and reliability of self-reported physical activity status: The lipid research clinics questionnaire. Medicine and Science in Sports and Exercise, 25, 92-98.

Ainsworth, B. E., Montoye, H. J. & Leon, A. S. (1994). Methods of assessing physical activity during leisure and work. In C. Bouchard, R. J. Shephard & T. Stephens (Eds.), Physical Activity, Fitness, and Health: International Proceedings and Consensus Statement (pp. 146-159). Champaign, IL: Human Kinetics Publishers.

Aldoori, W. H., et al. (1995). Prospective study of physical activity and the risk of symptomatic diverticular disease in men. Gut, 36, 276-282.

Anderson, R. E., Crespo, C. J., Bartlett, S. J., Cheskin, L.J., Pratt, M. (1998). Relationship from the third national health and nutrition examination survey. Journal of the American Medical Association, 279(12), 938-942.

Anhalt, L. (1994). Worksite health promotion programs...before and after President Clinton's proposed health care reform. Wellness Perspectives, 10(4), 26-39.

Annesi, J. J. (1996). Relevant retention research. Fitness Management, 12(10), 42.

Army Personnel Survey Office, USARI. (1996). 1995 Survey of Army families III: Executive summary. Alexandria, VA: U.S. Army Community and Family Support Center.

Baecke, J. A., Burema, J. & Frijters, J. E. (1982). A short questionnaire for the measurement of habitual physical activity in epidemiological studies. The American Journal of Clinical Nutrition, 36, 936-942.

Baranowski, T. (1988). Validity and reliability of self-report measures of physical activity: An information-processing perspective. Research Quarterly For Exercise and Sport, 59(4), 314-327.

Baranowski, T., Thompson, W. O., DuRant, R. H., Baranowski, J. & Puhl, J. (1993). Observation on physical activity in physical locations: Age, gender, ethnicity, and month effects. Research Quarterly for Exercise and Sports, 64(2), 127-133.

Baranowski, T., Dworkin, R. J., Cieslik, C. J., Hooks, P., Clearmen, D. R., Ray, L., Dunn, K. & Nader, P. R. (1984). Reliability and validity of self-report of aerobic activity: Family health project. Research Quarterly, 55(4), 309-317.

Bar-Or, O. (1985). Exercise and sport sciences reviews. American College of Sports Medicine, 13, 305-334.

Bar-Or, O. (1987). A commentary to children and fitness: A public health perspective. Research Quarterly for Exercise and Sports, 58(4), 304-307.

Bearinger, L. & Gephart, J. (1987). Priorities for adolescent health: Recommendations of a national conference. MCN, 12(May/June), 161-164.

Bell, D. B., Stevens, M. L. & Segal, M. W. (1996). How to support families during overseas deployments: A sourcebook for service providers. (Research Report 1687). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Bensky, J. M. (1995). Partners in wellness. Fitness Management, 11(11), 35-37.

Biddle, S. (1993). Children, exercise and mental health. International Journal of Sport Psychology, 24, 200-216.

Blair, S. N., Haskell, W. L., Ho, P., Paffenbarger, R. S., Vranizan, K. M., Farquhar, J. W. & Wood, P. (1985). Assessment of habitual physical activity by a seven-day recall in a community survey and controlled experiments. American Journal of Epidemiology, 122(5), 794-804.

Blair, S. N. (1984). How to assess exercise habits and physical fitness. In C. Bouchard, R. J. Shephard, T. Stephens, J. R. Sutton, & B. D. McPherson (Eds.), Behavioral health: A handbook of health enhancement and disease prevention. New York: John Wiley & Sons.

Blair, S. N. (1995). Diet and activity: The synergistic merger. Nutrition Today, 30(3), 108-113.

Blair, S. N., et al. (1996). Physical activity, nutrition, and chronic disease. Medicine and Science in Sports and Exercise, 28(3), 335-349.

Blue, C. L. (1995). The predictive capacity of the theory of reasoned action and the theory of planned behavior in exercise research: An integrated literature review. Research in Nursing and Health, 18, 105-121.

Blue, C. L. & Conrad, K. M. (1995). Adherence to worksite exercise programs: An integrative review of recent research. AAOHN Journal, 43(2).

Bonen, A. & Shaw, S. M. (1995). Recreational exercise participation and aerobic fitness in men and women: Analysis of data from a national survey. Journal of Sports Sciences, 13, 297-303.

Booth, M. L., et al. (1993). Population prevalence and correlates of stages of change in physical activity. Health Education Quarterly, 20(3), 430-439.

Booth-Kewley, S. & Thomas, M. D. (1993). The subjective quality of life of Navy personnel. (TR-93-8). San Diego: Navy Personnel Research and Development Center.

Bora, S. T., Schwartz, N.E., Spain, C. G. & Natchipolsky, M. M. (1995). Food, physical activity, and fun: Inspiring America's kids to more healthful lifestyles. Journal of the American Dietetic Association, 95(7), 816-818.

Bourne, M. J., Conway, T. L. & Coben, P.A. (1994). Navy physical readiness test: Evaluation of the command summary report (Final Report 93-29). San Diego: Naval Health Research Center.

Boutcher, S. H. (1991). The influence of aerobic exercise on illness. In L. Daumant (Ed.), Psychology of Sports, Exercise and Fitness, (pp. 103-118). New York, NY: Hemisphere.

Brandon, J. E., Loftin, M. & Thompson, B. (1988). The eating and exercise behavior questionnaire: A validity assessment. Health Education, Feb/Mar, 6-10.

Brawley, M. (1993). Practicality of using psychological theories for exercise and health research and intervention. Journal of Applied Sport Psychology, 5(2), 1041.

Brayant, C. X. & Peterson, J. A. (1995). Measuring strength. Fitness Management, 11(7), 32.

Brehm, B. A. (1995). Time management improves quality of life. Fitness Management, 11(11), 28-29.

Brehm, B. A. (1996). Women's studies: Exercise offers benefits. Fitness Management, 12(10), 23.

Breslow, L. & Enstrom, J. E. (1980). Persistence of health habits and their relationship to mortality. Preventive Medicine, 9, 469-483.

Brooks, L. (1995). The psychology of design. Fitness Management, 11(4), 36.

Brustad, R. J. (1996). Attraction to physical activity in urban schoolchildren: Parental socialization and gender influences. Research Quarterly for Exercise and Sport, 67(3), 316-323.

Bryant, C. X. & Peterson, J. A. (1996). All exercise is not equal. Fitness Management, 12(8), 32-34.

Bryant, C. X. & Peterson, J.A. (1995). How hard is hard enough? Fitness Management, 11(11), 42-45.

Buskirk, E. R., Harris, D., Mendez, J. & Skinner, J. (1971). Comparison of two assessments of physical activity and a survey method for calorie intake. The American Journal of Clinical Nutrition, 24, 1119-1125.

Cagle, R. (1996). Fitness activism. Fitness Management, 12(7), 38.

Callery, Y. C. & Schepis-Mallon, N. (1995). Fitness for duty policy: Implementation for the workplace. AAOHN Journal, 43(10), 522.

Carron, A. V., Hausenblas, H. A. & Mack, D. (1996). Social influence and exercise: A meta-analysis. Journal of Sport & Exercise Psychology, 18, 1-16.

Cash, T. F., Novy, P. L. & Grant, J. R. (1994). Why do women exercise? Factor analysis and further validation of the reasons for exercise inventory. Perceptual and Motor Skills, 78, 539-544.

Caspersen, C. J., Powell, K. E. & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. Public Health Reports, 100(2), 126-131.

Casperson, C. J. (1995). Physical activity trends among 26 states, 1986-1990. Medicine and Science in Sports and Exercise, 27(5), 713-720.

Cassel, R. N. (1993). Developing global functioning of military personnel: An essential element of Air Force leadership. Journal of Instructional Psychology, 20(3), 192-196.

Chadbourne, R. D. (1996). Fit for hire. Fitness Management, 12(2), 28.

Collins, T. N. (1991). Enhancing the physical fitness in the Marine Corps. Monterey, CA: Naval Postgraduate School.

Conrad, K. M., Riedel, J. E. & Gibbs, J. D (1990). Effect of worksite health promotion programs on employee absenteeism: A comparative analysis. AAOHN Journal, 38(12), 573-580.

Conrad, K. M. & Blue, C. L. (1995). Physical fitness and employee absenteeism. AAOHN Journal, 43, 577.

Conrad, P. (1987). Who comes to work-site wellness programs? A preliminary review. Journal of Occupational Medicine, 29(4), 317-319.

Conway, D. S. (1988). Exercise patterns in the U.S. Navy. (Interim Report 88-1). San Diego: Health Psychology Department, Naval Health Research Center.

Conway, S. I. (1991). A longitudinal assessment of the impact of health/fitness status and health behavior on perceived life quality. (Interim 91-3). San Diego: Naval Health Research Center.

Crespo, C. J., Keteyian, S. J., Heath, G. W. & Sempos, C.T. (1996). Leisure-time physical activity among U.S. adults: Results from the third national health and nutrition examination survey. Archives of Internal Medicine, 156(January 8), 93-98.

Daley, A. J. & Parfitt, G. (1996). Good health-is it worth it? Mood states, physical well being, job satisfaction and absenteeism in members and non-members of a British corporate health and fitness club. Journal of Occupational & Organizational Psychology, 69(2), 121-134.

Department of Defense, OotASoD, Personnel and Readiness. (1997). Occupational conversion index: Enlisted/officer/civilian. Washington, DC: DoD.

Destadio, F. J. (1991). Peacetime physical fitness and its effect on combat readiness an Air Force perspective. (Report # A236048). Carlisle Barracks, PA: U.S. Army War College.

DeVoe, D. & Kennedy, C. (1997). Physical activity and fitness pattern of children in private elementary schools. American Journal of Health Studies, 13(2), 84-88.

Diamant, L. (1991). Theory and research in sports, exercise, and fitness psychology. In L. Diamant (Ed.), Psychology of Sports, Exercise, and Fitness (pp. 5-17): New York, NY: Hemisphere.

Dietz, W. H. (1996). The role of lifestyle in health: The epidemiology and consequences of inactivity. Proceedings of the Nutrition Society, 55, 829-840.

- DiPietro, L., Casperson, C. J., Ostfeld, A. M. & Nadel, E. R. (1993). A survey for assessing physical activity among older adults. Medicine and Science in Sports and Exercise, 25(5), 628-642.
- Dishman, R. K. (1982). Health psychology and exercise adherence. Quest, 33(2), 166-180.
- Dishman, R. K. (1994). The measurement conundrum in exercise adherence research. Medicine and Science in Sports and Exercise, 26(11), 1382-90.
- Dishman, R. K. & Gettman, L. R. (1980). Psychobiologic influences on exercise adherence. Journal of Sport Psychology, 2, 295-310.
- Dishman, R. K., Sallis J. F. & Orenstein D. R. (1985). The determinants of physical activity and exercise. Public Health Reports, 100(2), 158-171.
- Douglas, K. A., et al. 1997). Results from the 1995 national college health risk behavior survey. Journal of American College Health, 46(2), 55-66.
- Douthitt, L. (1994). Physiological determinants of adolescent exercise adherence. Adolescence, 29(115), 712.
- Dubbert, P. M. (1992). Exercise in behavioral medicine. Journal of Consulting and Clinical Psychology, 60(4), 613-618.
- Duda, J. L. (1991). Motivating older adults for physical activity. Journal of Physical Education, Recreation and Dance, September, 44-50.
- Duda, J. L. & Tappe, M. K. (1988). Predictors of personal investment in physical activity among middle-aged and older adults. Perceptual and Motor Skills, 66, 543-549.
- Duncan, T. E., McAuley, E., Stoolmiller, M. & Duncan, S. C. (1993). Serial fluctuations in exercise behavior as a function of social support and efficacy cognitions. Journal of Applied Social Psychology, 23(18), 1498-1522.
- Dytell, R. S., Trent, L. K. & Conway, T. L. (1991). A causal analysis of interrelationship among exercise, physical fitness, and well-being in U.S. Navy personnel. (Report # 91-27). San Diego: Naval Health Research Center.
- Dzewaltowski, D. A. (1989). Toward a model of exercise motivation. Journal of Sport and Exercise Psychology, 11, 251-269.
- Eaton, C. B., Nafziger, A. N., Strogatz, D.S. & Pearson, T.A. (1994). Self-reported physical activity in a rural county: A New York county health census. American Journal of Public Health, 84(1), 29-32.
- Eccles, J. S. & Harold, R.D. (1991). Gender differences in sport involvement: Applying the Eccles' expectancy-value model. Journal of Applied Sport Psychology, 3, 7-35.
- Finney, C. (1984). Corporate benefits of employee recreation programs. Parks and Recreation, 19(8), 44-46.
- Folsom, A. R., Jacobs, D. R., Casperson, C. J., Gomez-Marin, O. & Knudson, J. (1986). Test-retest reliability of the Minnesota leisure time physical activity questionnaire. Journal of Chronic Disease, 39(7), 505-511.

Folsom, A. R., Casperson, C. J., Taylor, D. R., Jacobs, D. R., Luepker, R. V., Gomez-Marin, O., Gillum, R. F. & Blackburn, H. (1985). Leisure time physical activity and its relationship to coronary risk factors in a population-based sample: The Minnesota heart survey. American Journal of Epidemiology, 121(4), 570-579.

Galuska, D. A., et al. (1996). Trends in overweight among U.S. adults from 1987 to 1993: A multistate telephone survey. American Journal of Public Health, 86(12), 1729-1735.

Garrow, J. S. (1995). Review: Meta-analysis: Effect of exercise, with or without dieting, on the body composition of overweight subjects. European Journal of Clinical Nutrition, 49, 1-10.

Gauvin, L. (1996). Physical activity and psychological well being: Knowledge base, current issues, and caveats. Nutrition Reviews, 54(4), S53-S65.

Gilbert, G. G., Montes, H. & Ross, J. G. (1985). The national children and youth fitness study: History. Journal of Physical Education, Recreation and Dance, January, 9-11.

Gilliam, T. B., Freedson, P. S., Geenen, D. L. & Shahraray, B. (1981). Physical activity patterns determined by heart rate monitoring in 6-7 year-old children. Medicine and Science in Sports and Exercise, 13(1), 65-67.

Gillum, R. F., Mussolini, M. E. & Ingram, D. D. (1996). Physical activity and stroke incidence in women and men: The NHANES I epidemiologic follow-up study. American Journal of Epidemiology, 143(9), 860-869.

Godin, G., Jobin, J. & Bouillon, J. (1986). Assessment of leisure time exercise behavior by self-report: A concurrent validity study. Canadian Journal of Public Health, 77,(September/October), 359-362.

Godin, G. & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. Canadian Journal of Applied Sport Science, 10(3), 141-146.

Goodrick, G. K., Poston II, W.S.C. & Foreyt, J.P. (1996). Methods for voluntary weight loss and control: Update 1996. Nutrition, 12(10), 672-676.

Gorman, D. O., Brown, B. S. & DiBrezzo, R. (1986). Professional training for corporate wellness personnel: Survey results from practicing professionals. Health Education, 17(5), 71-74.

Grodstein, F., et al. (1996). Three-year follow-up of participants in a commercial weight loss program. Archives of Internal Medicine, 156(June 24), 1302-1306.

Harro, M. (1997). Validation of a questionnaire to assess physical activity of children ages 4-8 years. Research Quarterly for Exercise and Sport, 68(4), 259-268.

Haskell, W. L. (1984). Overview: Health benefits of exercise. In J. D. Matarazzo, S. M. Weiss, J. A. Herd, N. E. Miller, & S. M. Weiss (Eds.),

Behavioral Health: A Handbook of Health Enhancement and Disease Prevention (pp. 409-423): John Wiley & Sons, Inc.

Haskell, W. L., Montoye, H. J. & Orenstein, D. (1985). Physical activity and exercise to achieve health related physical fitness components. Public Health Reports, 100(2), 202-211.

Haskell, W. L., Taylor, H. L., Wood, P. D., Schrott, H. & Heiss, G. (1980). Strenuous physical activity, treadmill exercise test performance and plasma high-density lipoprotein cholesterol: The lipid research clinics program prevalence study. Circulation, 62(suppl IV), 53-61.

Hatfield, B. D. (1991). Exercise and mental health: The mechanisms of exercise induced psychological states. In L. Diamant (Ed.), Psychology of Sports, Exercise, and Fitness (pp. 17-47). New York, NY: Hemisphere.

Hayes, A. (1984). Youth physical fitness hearings. An interim report from the president's council on physical fitness and sports. Journal of Physical Recreation, Recreation, & Dance, 55(9), 29-32, 40.

Hays, R. D. (1989). Robustness of a model of exercise. Journal of Behavioral Medicine, 12(6), 599-603.

Herbert, D. L. (1995). First state licenses exercise physiologists. Fitness Management, 11(11), 26-27.

Heyward, V. H. (1991). Advanced fitness assessment and exercise prescription. (2nd ed.). Champaign, IL: Human Kinetics Books.

Hodgdon, J. A. (1986). Physical fitness as it pertains to sustained military operations. (Final Report #86-12). San Diego: Naval Health Research Center.

Hodgdon, J. A. (1990). Body composition in military services: Standards and methods. (Final Report # 90-21). San Diego: Naval Health Research Center.

Hoffman, D. (1996). Gauging kids' activity patterns. Physician and Sports Medicine, 24(10), 26g.

Huddy, C. D., Herbert, J. L., Hyner, G. C. & Johnson, R. L. (1995). Facilitating changes in exercise behavior: Effect of structured statements of intention on perceived barriers to action. Psychological Reports, 76, 867-875.

Hudson, N. (1994). Military plays weighting game: Fat limits may rise, giving some reprieve. Navy Times, (7/4/94), pp. 4.

Hull. (1995). Improved health or impaired hearing. Fitness Management, 11(5), 40.

Igoe, J. (1992). Health promotion, health protection, and disease prevention in childhood. Pediatric Nursing, 18(3), 291-292.

Jacobs, D. R., Luepker, R. V., Mittelmark, M. B., Folsom, A. R., Pirie, P. L., Mascioli, S. R., Hannan, P. J., Pechacek, T. F., Bracht, N. F., Carlaw, R. W., Kline, G. F. & Blackburn, H. (1986). Community wide prevention strategies: Evaluation design of the Minnesota heart health program. Journal of Chronic Disease, 39(10), 775-788.

Jacobs, D. R., Ainsworth, B. E., Hartman, T. L. & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. Medicine and Science in Sports and Exercise, 25(1), 81-91.

Jeffreys, D. J., Leitzel, J. D., Cabral, G., Gumpert, J., Hartley, E., Lare, D., Nagy, N.M., O'Brien, E.J., Russo, T.J., Salvaterra, M. & Strobino, J. (1997). Military adolescents: Their strengths and vulnerabilities. (MFI Technical Report 97-4). Scranton, PA: Military Family Institute, Marywood University.

Jones, D. (1996). Building for programs of the future. Fitness Management, 12(5), 27.

Jowers, K. (1994). 'New' gyms boost readiness. Army Times, (12/5/94), pp. 10.

Jowers, K. (1994). Readiness takes a new twist at fitness centers. Navy Times, (9/12/94).

Jowers, K. (1996). Tuning into TV habits survey: Military households keep the tube on longer. Navy Times, (12/30/96), pp. 22.

Kannel, W. B., Wilson, P. & Blair, S. N. (1985). Epidemiological assessment of the role of physical activity and fitness in development of cardiovascular disease. The American Heart Journal, 109(4), 876-885.

Kendzierski, D. (1990). Decision making versus decision implementation: An action control approach to exercise adoption and adherence. Journal of Applied Psychology, 20(1), 27-45.

Kendzierski, D. & Johnson, W. (1993). Excuses, excuses, excuses: A cognitive behavioral approach to exercise implementation. Journal of Sport and Exercise Psychology, 15, 207-219.

Kenyon, G. (1968). A conceptual model for characterizing physical activity. The Research Quarterly, 39(1), 96-105.

Kenyon, G. (1968). Six scales for assessing attitude toward physical activity. The Research Quarterly, 39(3), 566-574.

Kerce, E. W. (1988). A prototype for program evaluation of Navy family service centers. (Technical Note MPRDC-TN-88-48). San Diego: Navy Personnel Research and Development Center.

Kerce, E. W. (1995). Quality of life in the U.S. Marine Corps. (Technical Report NPRDC-TR-95-4). San Diego: Navy Personnel Research and Development Center.

Kimiecik, J. (1991). Motivating adults for physical activity: Toward a healthier present. Journal of Physical Education, Recreation and Dance, September, 39-43.

Kimiecik, J. C., Horn, T. S. & Shurin, C. S. (1996). Relationships among children's beliefs, perceptions of their parents' beliefs, and their moderate to vigorous physical activity. Research Quarterly for Exercise and Sport, 67(3), 324-336.

King, A. C. (1994). Community and public health approaches to the promotion of physical activity. Medicine and Science in Sports and Exercise, 26(11), 1405-1412.

King, J. M., O'Brien, D. E. & Mangelsdorff, A. D. (1986). Evaluation of the Army physical training and weight control programs. (Final Report A164898). Fort Sam Houston, TX: U.S. Army Health Care Studies & Clinical Investigation Activity.

Kingery, P. M., Uhalt, J. S., Bowden, R. G., Brizzolara, J. A. & Corbett, B. S. (1996). Evening and weekend use of university fitness facilities by employees: Evidence of unmet needs for worksite health promotion. Journal of Wellness Perspectives, 12(3), 149.

Klesges, L. M. & Klesges, R. C. (1987). The assessment of children's physical activity: A comparison of methods. Medicine and Science in Sports and Exercise, 19(5), 511-517.

Klesges, R. C., Eck, L. H., Hanson, C. L., Haddock, C. K. & Klesges, L. M. (1990). Effects of obesity, social interactions, and physical environment on physical activity in preschoolers. Health Psychology, 9(4), 435-449.

Klesges, R. C., Eck, L. H., Mellon, M., Fulliton, W., Somes, G. & Hanson, C. (1990). The accuracy of self-reports of physical activity. Medicine and Science in Sports and Exercise, 22, 5, 690-697.

Knapik, J. (1989). The Army physical fitness test (APFT): A review of the literature. Military Medicine, 154(6), 326-329.

Knapik, J., Banderet, L., Bahrke, M., O'Connor, J., Jones, B. & Vogel, J. (1993). Army physical fitness test (APFT): Normative data on 6022 soldiers. (T97-7, A274547). Natick, MA: U.S. Army Research Institute of Environmental Medicine.

Kolevar, S. F. (1995). Incentive games: How to motivate exercisers by using incentive game programs. Fitness Management, 11(12), 34-36.

Koop, C. E. (1996). Koop stresses family fitness. Journal of Physical Education, Recreation and Dance, 67(6), 9.

Kravitz. (1995). Flexibility training. Fitness Management, 11(2), 32.

Lakhani, H. (1995). Reenlistment intentions of citizen soldiers in the U.S. Army. Armed Forces and Society, 22(1), 117-130.

Landers, D. M. (1997). The influence of exercise on mental health. President's Council on Physical Fitness and Sports Research Digest, 2(12), 2-6.

LaPorte, R. E., Kuller, L. H., Kupfer, D. J., McPartland, R. J., Mathews, G. & Caspersen, C. (1979). An objective measure of physical activity for epidemiologic research. American Journal of Epidemiology, 109(2), 158-168.

LaPorte, R. E., Montoye, H. J. & Caspersen, C. J. (1985). Assessment of physical activity in epidemiologic research: Problems and prospects. Public Health Reports, 100(2), 131-146.

Leary, M. R. (1992). Self-presentational processes in exercise and sport. Journal of Sport and Exercise Psychology, 14, 339-351.

Lee, J. A. (1991). Sports in the workplace: Do they pay? In L. Daumant (Ed.), Psychology of Sports, Exercise and Fitness (pp. 167-185). New York, NY: Hemisphere.

Leith, L. M. & Taylor, A. H. (1992). Behavior modification and exercise adherence. Journal of Sport Behavior, 15(1), 60-74.

Leon, A. S., Connett, J., Jacobs, D. R. & Rauramaa, R. (1987). Leisure-time physical activity intervention trial. Journal of the American Medical Association, 258(17), 2388-2395.

Leon, A. S., Jacobs, D. R., DeBacker, G. & Taylor, H. L. (1981). Relationship of physical characteristics and life habits to treadmill exercise capacity. American Journal of Epidemiology, 113(6), 653-659.

Leutzinger, J. & Blanke, D. (1991). The effect of a corporate fitness program on perceived worker productivity. Health Values, 15(5), 20.

Lewis, C. E., et al. (1997). Seven-year trends in body weight and associations with lifestyles and behavioral characteristics in black and white young adults: the Cardia study. American Journal of Public Health, 87(4), 635-642.

Lombard, D. M., Lombard, T. N. & Winett, R. A. (1995). Walking to meet health guidelines: The effect of prompting frequency and prompt structure. Health Psychology, 14(2), 164-170.

Lupton, C. H., et al. (1984). Participation in leisure-time physical activity: A comparison of the existing data. Journal of Physical Education, Recreation, and Dance, 55(9), 19-23.

Marcus, B. H., Eaton, C. A., Rossi, J. S. & Harlow, L. L. (1994). Self-efficacy, decision making, and stages of change: An integrative model of physical exercise. Journal of Applied Social Psychology, 24(6), 489-508.

Marcus, B. H., Rossi, J. S., Selby, V. C., Niaura, R. S. & Abrams, D. B. (1992). The stages and processes of exercise adoption and maintenance in a worksite sample. Health Psychology, 11(6), 386-395.

Marcus, B. H. & Simkin, L. R. (1994). The transtheoretical model: Applications to exercise behavior. Medicine and Science in Sports and Exercise, 26(11), 1400-1404.

Markland, D. & Hardy, L. (1993). The exercise motivations inventory: preliminary development and validity of a measure of individuals' reasons for participation in regular physical exercise. Personality & Individual Differences, 15(3), 289-296.

Marks, B. L., Ward, A., Morris, D.H., Castellani, J. & Rippe, J.M. (1995). Fat-free mass is maintained in women following a moderate diet and exercise program. Medicine and Science in Sports and Exercise, 1243-1251.

Martens, R. (1996). Turning kids on to physical activity for a lifetime. Quest, 48(3), 303-310.

McAuley, E., Courneya, K., Rudolph, D. & Lox, C. (1994). Enhancing exercise adherence in middle-aged males and females. Preventive Medicine, 23, 498-506.

McAuley, E., Paog, K., Gleason, A. & Wraith, S. (1990). Attrition from exercise programs: Attributional and affective perspectives. Journal of Social Behavior and Personality, 5(6), 591-602.

McGinnis, J. M. (1985). Summary of findings from national children and youth fitness study. Journal of Physical Education, Recreation, and Dance, 56(1), 44-90.

McKenzie, T. L., Strikmiller, P. K., Stone, E. J., Woods, S. E., Elhlinger, S. S., Romero, K. A. & Budman, S. T. (1994). CATCH: Physical activity process evaluation in a multicenter trial. Health Education Quarterly, Supp 2, S73-89.

McKenzie, T. L., Sallis, J.F., Elder, J. P., Berry, C. C., Hoy, P. L., Nader, P. R., Zive, M. M. & Broyles, S. L. (1997). Physical activity levels and prompts in young children at recess: A two-year study of a bi-ethnic sample. Research Quarterly for Exercise and Sport, 68(3), 195-202.

Meyers, L., Strikmiller, P.K., Webber, L.S. & Berenson, G.S. (1996). Physical and sedentary activity in school children grades 5-8: The Bogalusa heart study. Medicine and Science in Sports and Exercise, 28(7), 852-859.

MMWR. (1996). Prevalence of physical inactivity during leisure time among overweight persons: 1994. Journal of the American Medical Association, 275, 185-188.

Montoye, H. J. & Taylor, H. L. (1984). Measurement of physical activity in population studies: A review. Human Biology, 56(2), 196-216.

Moriarty, D., Moriarity, M. & Rollison, S. (1991). The role of physical and health educators and coaches in the prevention of eating disorders. Paper presented at the Annual International Conference for Health, Physical Education, and Recreation, Limerick, Ireland. pp. 1-34.

Noland, M. P. & Feldman, R. H. L. (1985). An empirical investigation of leisure exercise behavior in adult women. Health Education, Oct/Nov, 29-34.

Nottingham, S. (1995). Cross training. Fitness Management, 11(11), 32-34.

O'Connor, J. S., Bahrke, M.S. & Tetu, R.G. (1990). 1988 active Army physical fitness survey. Military Medicine, 155(12), 579-585.

O'Hara, N. M., Naranowski, T., Simons-Morton, E. G., Wilson, B. S. & Parcel, G. S. (1989). Validity of the observation of children's physical activity. Research Quarterly for Exercise and Sport, 60(1), 42-47.

Ostrow, A. C. (Ed.). (1990). Directory of psychological tests in the sport and exercise sciences. Morgantown, WV: Fitness Information Technology, Inc., pp. 193-227.

Paffenbarger, R. S., Wing, A. L. & Hyde, R. T. (1978). Physical activity as an index of heart attack risk in college alumni. American Journal of Epidemiology, 108(3), 161-175.

Paffenbarger, R. S., Blair, S. N., Lee, I. M. & Hyde, R. T (1993). Measurement of physical activity to assess health effects in free-living populations. Medicine and Science in Sports and Exercise, 25(1), 60-70.

Pangrazi, R. P., Corbin, C.B., Welk, G.J. (1996). Physical activity for children and youth. Journal of Physical Education, Recreation and Dance, 67(4), 38-43.

Parcel, G. S., Simons-Morton, B., O'Hara, N. M., Baranowski, T. & Wilson, B. (1989). School promotion of healthful diet and physical activity: Impact on learning outcomes and self-reported behavior. Health Education Quarterly, 16(2), 181-199.

Patton, J. F., Vogel, J.A., Damokosh, A.I. & Mello, R.P. (1987). Effects Of continuous military operations on physical fitness capacity and physical performance. (AD-A185 722). Natick, MA: U.S. Army Research Institute of Environmental Medicine.

Pessin, F. (1995). Getting in touch with the mind/body market. Fitness Management, 11(11), 40, 45.

Peterson, J. A., Bryant, C. X. & Stevenson, R. (1996). Making professional certification work. Fitness Management, 12(8), 36-38.

Pica, R. (1997). Beyond physical development: Why young children need to move. Young Children, 52(6), 4-11.

Pleban, R. J., Thomas, D. A. & Thompson, H. L. (1985). Physical fitness as a moderator of cognitive work capacity and fatigue onset under sustained combat-like operations. (Final Report A160417). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences Fort Benning, GA.

Poag, K. A. & McAuley, E. (1992). Goal setting, self-efficacy, and exercise behavior. Journal of Sport and Exercise Psychology, 14, 352-360.

Poag-DuCharme, K. A. & Brawley, L. (1993). Self-efficacy theory: Use in the prediction of exercise behavior in the community setting. Journal of Applied Sport Psychology, 5, 178-194.

Porcari, J. & Curtis, J. (1996). Can you work with strength and fitness at the same time. Fitness Management, 12(7), 26.

Potvin, L., Gauvin, L. & Nguyen, N.M. (1997). Prevalence of stages of change for physical activity in rural, suburban, and inner-city communities. Journal of Community Health, 22(1), 1-13.

Powell, G. D., Dumitru, D. & Kennedy, J. J. (1993). The effect of command emphasis and monthly physical training on Army physical fitness scores in a National Guard unit. Military Medicine, 158(5), 294-297.

Powell, K. E., Thompson, P. D., Casperson, C. J. & Kendrick, J. S. (1987). Physical activity and the incidence of coronary heart disease. Annual Review of Public Health, 8, 253-287.

Powell, K. E. & Pratt, M. (1996). Physical activity and health. British Medical Journal, 313(7050), 126-127.

- Prusaczyk, W. K., Goforth, H. W. & Nelson, M. L. (1994). Physical training activities of east coast U.S. Navy SEALs (Final 94-24). San Diego: Naval Health Research Center, 2-24.
- Prusaczyk, W. K., Stuster, J. W., Goforth, H. W., Smith, T. S. & Meyer, L. T. (1995). Physical demands of U.S. Navy Sea-Air-Land (SEAL) operations. (Final Report 95-24). San Diego: Naval Health Research Center.
- Quarrie, B. P. (1989). Air Force weight and fitness programs. Maxwell Air Force Base, AL: Air University United States Air Force.
- Rabinowitz, S., et al. (1992). Personal determinants of leisure-time exercise activities. Perceptual and Motor Skills, 75, 779-784.
- Rainwater. (1995). Managing your personal fitness. Fitness Management, 11(2), 46.
- Riddoch, C. J. & Boreham, C. A. (1995). The health related physical activity of children. Sports Medicine, 19(2), 86-102.
- Robinson, T. N. & Killen, J. D. (1995). Ethnic and gender differences in the relationships between television viewing and obesity, physical activity, and dietary fat intake. Journal of Health Education, 26(2), 91-98.
- Robison, J. I. & Rogers, M. A. (1994). Adherence to exercise programs. Sports Medicine, 17(1), 39-52.
- Ross, J. G., Gilbert, G. G. & Dotson, C. O. (1984). Youth fitness revisited: Part I. Parks and Recreation, 19(12), 41-44, 66-67.
- Ross, J. G. & Gilbert, G.G. (1985). The national children and youth fitness study: A summary of findings. Journal of Physical Education, Recreation and Dance, 47, 3-8.
- Ross, J. G. & Pate, R. R. (1987). The national children and youth fitness study II: A summary of findings. Journal of Physical Education, Recreation and Dance, November-December, 51-56.
- Rost, K. K., Connell, C., Schectman, K., Barzilai, B. & Fisher, E. B. (1990). Predictors of employee involvement in a worksite health promotion program. Health Education Quarterly, 17(4), 395-407.
- Rothberg, J. M. (1987). Some thoughts on health promotion in the United States Army. Paper presented at the Inter-University Seminar on Armed Forces and Society Biennial Conference, Chicago, 1-14.
- Rowland, T. W. (1994). Physical activity, fitness, and health in children: A close look: commentaries. Pediatrics, 93(4), 669-672.
- Rubin, A. & Haller, D. L. (1997). Bone mineral density in boys and girls. Physician & Sports Medicine, 25(4), 24h.
- Rubin, A. & Loosli, A. (1997). How active are third graders? Physician & Sports Medicine, 25(5), 120k-120i.
- Russell, J. C. (1996). Family friendly fitness. Fitness Management, 12(6), 34.
- Sallis, J. F. (1987). A commentary on children and fitness: A public health perspective. Research Quarterly for Exercise and Sport, 58(4), 326-330.

Sallis, J. F., Haskell, W. L., Wood, P. D., Fortmann, S. P., Rogers, T., Blair, S. N. & Paffenbarger, R. S. (1985). Physical activity assessment methodology in the five-city project. American Journal of Epidemiology, 121(1), 91-107.

Sallis, J. F., Simons-Morton, B. G., Stone, E. J., Corbin, C. B., Epstein, L. H., Faucette, N., Ianotti, R. J., Killen, J. D., Klesges, R. C., Petray, C. K., Rowland, T. W. & Taylor, W. C. (1992). Determinants of physical activity and interventions in youth. Medicine and Science in Sports and Exercise, 24(6), 248-257.

Sallis, J. F., McKenzie, T. L., Alcaraz, J. E., Kolody, B., Faucette, N. & Hovell, M. E. (1997). The effect of a 2-year physical educational program (SPARK) on physical activity and fitness in elementary school students. American Journal of Public Health, 87(8), 1328-1338.

Sallis, J. F., Patterson, T. L., McKenzie, T. L. & Nader, P. R. (1988). Family variables and physical activity in preschool children. Developmental and Behavioral Pediatrics, 9(2), 57-60.

Sallis, J. F., Hofstetter, C. R., Elder, J. P.; Hackley, M., Caspersen, C. J. & Powell, K. E. (1990). Distance between homes and exercise facilities related to frequency of exercise among San Diego residents. Public Health Reports, 105(2), 179-185.

Saris, W. (1986). Habitual physical activity in children: Methodology and findings in health and disease. Medicine and Science in Sports and Exercise, 18(3), 253-263.

Sattler, T. P. (1995). Production techniques for the fitness industry. Fitness Management, 11(11), 50-51.

Sattler, T. P. (1995). Worksite wellness for the health of it. Fitness Management, 11(13), 18-22.

Schechtman, K. B., Barzilai, B., Rost, K. & Fisher, E. B. (1991). Measuring physical activity with a single question. American Journal of Public Health, 81(6), 771-774.

Schutz, R. W., Smoll, F. L. & Wood, T. M. (1981). A psychometric analysis of an inventory for assessing children's attitudes toward physical activity. Journal of Sport Psychology, 4, 321-344.

Schutz, R. W., Smoll, F. L., Carre, F. A. & Mosher, R. E. (1985). Inventories and norms for children's attitudes toward physical activity. Research Quarterly for Exercise and Sport, 56(3), 256-265.

Segesman, L. E. (1987). Civilian corporate fitness in the department of the Army: The newest dimension of civilian personnel management. (Individual Essay). Carlisle Barracks, PA: U.S. Army War College.

Sharp, M. A. (1993). Physical fitness, physical training and occupational performance of men and women in the U.S. Army: A review of literature. (Technical Note 93-7, A266297). Natick, MA: U.S. Army Research Institute of Environmental Medicine.

Shephard, R. J. (1996). Habitual physical activity and academic performance. Nutrition Reviews, 54(4), s32-s36.

Siconolfi, S. F., Lasater, T. M., Snow, R. C., & Carleton, R. A. (1985). Self-reported physical activity compared with maximal oxygen uptake. American Journal of Epidemiology, 122(1), 101-105.

Sidney, S., Jacobs, D. R., Haskell, W. L., Armstrong, M. A., Dimicco, A., Oberman, A., Savage, P. J., Slattery, M. L., Sternfeld, B. & Van Horn, L. (1991). Comparison of two methods of assessing physical activity in the coronary artery risk development in young adults (CARDIA) study. American Journal of Epidemiology, 133, No. 12, 1231-45.

Siegal, D., Johnson, J. & Newhof, C. (1988). Adherence to exercise and sports classes by college women. Journal of Sports Medicine and Physical Fitness, 28 (2), 181-188.

Siegel, D., Johnson, J. & Newhof, C. (1990). Motivation exercise. In J. Ostrow (Ed.), Directory of Psychological Tests on the Sport and Exercise Sciences (pp. 191-227). Morgantown: Fitness Information Technology Inc.

Silverman, S. (1998). Can a health-related physical education curriculum provide students with more physical activity? Journal of Physical Education, Recreation and Dance, 69(2), 6.

Silverman, S. (1998). How physically active are students during recess periods? Journal of Physical Education, Recreation and Dance, 69(3), 11.

Simono, R. B. (1991). Anxiety reduction through physical fitness. In Daumant (Ed.), Psychology of Sports, Exercise and Fitness (pp. 51-67). New York, NY: Hemisphere.

Simons-Morton, B. G., O'Hara, N., Simons-Morton, D. & Parcell, G. (1987). Children and fitness: A public health perspective. Research Quarterly, 58(4), 295-302.

Simons-Morton, B. G., Taylor, W.C., Snider, S. A. & Huang, I.W. (1993). The physical activity of fifth-grade students during physical education classes. American Journal of Public Health, 83(2), 262-264.

Simons-Morton, B. G., McKenzie, T. J., Stone, E., Michell, P., Osganian, V., Strikmiller, P., Ehlinger, S., Cribb, P. & Nader, P.R. (1997). Physical activity in a multi-ethnic population of third graders in four states. American Journal of Public Health, 87(1), 45-50.

Siscovick, D., LaPorte, R. & Newman, J. (1985). The disease-specific benefits and risks of physical activity and exercise. Public Health Reports, 100(2), 180-188.

Skender, M. L., et al. (1996). Comparison of 2-year weight loss trends in behavior treatments of obesity: Diet, exercise, and combination interventions. Journal of the American Dietetics Association, 96(4), 342-346.

Slattery, M. L., Jacobs, D. R. & Nichaman, M. Z. (1989). Leisure time physical activity and coronary heart disease death: The U.S. railroad study. Circulation, 79, 304-311.

Spannuth, J. (1989). Water: The new fitness center! Parks and Recreation, 24(2), 47-50.

Spink, K. S. & Carron, A. V. (1993). The effects of team building on the adherence patterns of female exercise participants. Journal of Sport and Exercise Psychology, 15, 39-49.

Sports, PsCoPFA. (1996). What you need to know about the Surgeon General's report on physical activity and health. President's Council on Physical Fitness and Sports Physical Activity and Fitness Research Digest, 2(6), 1-7.

Staver, P. (1995). The fitness force. Fitness Management, 11(12), 19-20.

Staver, P. (1995). Programming tips from a fitness veteran. Fitness Management, 11(4), 20.

Staver, P. (1995). Schools: Fitness for kids and you. Fitness, 11(2), 22.

Steinback, A. R. & Tombak, M. M. (1995). Time-based competition and the privatization of services. Journal of Industrial Economics, XLIII(4), 435-455.

Summerfield, L. M. (1991). Credentialing in the health, leisure, and movement professions. (Trends and issues paper no. 5). Washington, DC: ERIC Clearinghouse on Teacher Education.

Sweeney, S. S. & Bonnabeau, R. C. (1990). Positive and negative health behaviors used to ensure compliance with the U.S. Army's weight control standards by a reserve component unit. Military Medicine, 155(6), 255-260.

Synodinos, N. E., Papacostas, C. S. & Okimoto, G. M. (1994). Computer-administered versus paper and pencil surveys and the effect of sample selection. Psychonomic Society, 26(4), 395-401.

Tappe, M. K., Duda, J. L. & Menges-Ehrnwald, P. (1990). Personal investment predictors of adolescent motivational orientation toward exercise. Canadian Journal of Sport Science, 15(3), 185-192.

Taylor, C. B., Sallis, J. F. & Needle, R. (1985). The relation of physical activity and exercise to mental health. Public Health Reports, 100(2), 195-201.

Taylor, C. B., Coffey, T., Berra, K., Iaffaldano, R., Casey, K. & Haskell, W. L (1984). Seven-day activity and self-report compared to a direct measure of physical activity. American Journal of Epidemiology, 120(6), 818-824.

Taylor, H. L., Jacobs, D. R., Schucker, B., Knudsen, J., Leon, A. S. & Debacker, G. (1978). A questionnaire for the assessment of leisure time physical activities. Journal of Chronic Diseases, 31, 741-755.

Theodorakis, Y., Doganis, G., Bagiatis, K. & Gouthas, M. (1991). Preliminary study of the ability of reasoned action model in predicting exercise behavior of young children. Perceptual and Motor Skills, 72(1), 51-58.

Thompson, S., Knudson, P. & Wilson, D. (1997). Helping primary children with recess play: A social curriculum. Young Children, 52(6), 17-21.

Trent, L. K. & Hurtado, S.L. (1997). Longitudinal trends and gender differences in physical fitness and lifestyle factors in career U.S. Navy

personnel (1983-1994). (Interim Report 97-13). San Diego: Naval Health Research Center.

U.S. General Accounting Office (1994). Reserve forces DoD policies do not ensure that personnel meet medical and physical fitness standards. Report to the Chairman, Subcommittee on Readiness, Committee on Armed Services, House of Representatives: United States General Accounting Office.

U.S. Department of Health and Human Services (1995). Healthy people 2000: Midcourse review and 1995 revisions. Washington, DC: Author.

U.S. Department of Health and Human Services (1996). Physical activity and health: A report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Centers for Chronic Disease Prevention and Health Promotion.

Unger, J. & Johnson, C. A. (1995). Explaining exercise behavior and satisfaction with social exchange theory. Perceptual and Motor Skills, 81, 603-608.

Vogel, J. A. (1986). Fitness and activity assessments among U.S. Army populations: Implications for NCHS general population surveys. (Mil/86). Natick, MA: Exercise Physiology Division, U.S. Army Research Institute of Environmental Medicine.

Vogel, J. A. (1992). Obesity and its relation to physical fitness in the U.S. Military. Armed Forces & Society, 18(4), 497-513.

Wagner, J. (1996). Equipment: How do you know when to update. Fitness Management, 12(8), 30-31.

Wallace, J. P., et al. (1985). Observed vs. recalled exercise behavior: A validation of a seven-day exercise recall for boys 11 to 13 years old. Research Quarterly for Exercise and Sport, 56(2), 161-165.

Washburn, R. A. & Montoye, H. J. (1986). The assessment of physical activity by questionnaire. American Journal of Epidemiology, 123(4), 563-576.

Watanabe, H. K., Jensen, P. S., Rosen, L. N. Newby, J., Richters, J. E. & Cortes, R. M. (1995). Soldier functioning under chronic stress: Effects of family member illness. Military Medicine, 160(9), 457-461.

Westcott. (1995). Strength training for the aging adult. Fitness Management, 11(7), 28.

Wilson, B. R., Wheeler, D. D. & Stout, J. (1991). The effects of a corporate-sponsored physical fitness program on two computer administered performance tasks. Wellness Perspectives, 8(1), 70-75.

Wilson, P. W., Paffenbarger, R. S., Morris, J. N. & Havlik, R. J. (1986). Assessment methods for physical activity and physical fitness in population studies: Report of a NHLBI workshop. American Heart Journal, (June), 1177-1192.

Wilson, P. K. (1984). Industrial fitness, adult fitness, and cardiac rehabilitation. Graduate programs specific to training exercise specialists. Journal of Physical Education, Recreation, and Dance, 55(3), 40-44.

Woodruff, S. I. & Conway, T. L. (1991). A longitudinal assessment of the impact of health/fitness status and health behavior on perceived quality of life. (Interim Report 91-3). San Diego: Naval Health Research Center.

Woodruff, S. I. & Conway, T. L. (1994). U.S. Navy health surveillance, part 1: Feasibility of a health promotion tracking system. Military Medicine, 159(1), 24-31.

Woodruff, S. I. & Conway, T. L. (1994). U.S. Navy health surveillance, part 2: Responses to a health promotion tracking survey. Military Medicine, 159(1), 32-37.

Woodruff, S. I. & Conway, T.L. (1990). Impact of health and fitness-related behavior on quality of life.(Interim 90-26). San Diego: Naval Health Research Center.

Worsnop, R. L. (1996). Privatizing government services. CQ Researcher, (August), 699-706.

Zachwieja, J. J. (1996). Exercise as treatment for obesity. Endocrinology and Metabolism Clinics of North America, 25(4), 965-988.

Zelasko, C. J. (1995). Exercise for weight loss: What are the facts? Journal of the American Dietetic Association, 95(12), 1414-1417.

Appendices

Appendix A

Sampling Design

(Note: Appendixes B, C and D are published separately.)

Table A-1
Selected Installations and Military Members by Service and Duty Location

Installation	Service	Number of Selected Personnel	Number of Selected Families	Duty Location
Dover AFB	Air Force	427	313	CONUS
Norfolk Land - Navy NS	Navy	650	525	CONUS
Ft. Bragg	Army	572	457	CONUS
Patrick AFB	Air Force	397	290	CONUS
Great Lakes NTB	Navy	546	439	CONUS
Randolph AFB	Air Force	430	326	CONUS
MCAS Yuma	Marine Corps	266	206	CONUS
Camp Pendleton	Marine Corps	650	516	CONUS
Tripler Army Medical	Army	440	362	OCONUS
MCB Okinawa	Marine Corps	306	152	OCONUS
Ramstein AFB	Air Force	421	307	OCONUS
Quantico MCB	Marine Corps	290	228	CONUS
Norfolk Afloat - Navy	Navy	594	460	OCONUS
Cherry Point MCB	Marine Corps	286	217	CONUS
Ft. McClellan	Army	546	415	CONUS
Parris Island MCB	Marine Corps	288	217	CONUS
Fitzsimons AMC	Army	376	256	CONUS
Ft Hood	Army	572	466	CONUS
Luke AFB	Air Force	433	314	CONUS
El Toro MCAS	Marine Corps	280	221	CONUS
Barbers Point NS	Navy	476	339	OCONUS
Yokosuka NS	Navy	432	297	OCONUS
Darmstadt	Army	340	260	OCONUS
Norfolk - Marines MCB	Marine Corps	259	198	CONUS
Fort Meade	Navy	482	376	CONUS
Camp LeJeune MCB	Marine Corps	559	433	CONUS
Pensacola NAS	Navy	416	311	CONUS
Tinker AFB	Air Force	430	326	CONUS
NAS North Island	Navy	472	335	CONUS
Ft. Irwin	Army	545	423	CONUS
Kaneohe Bay MCB	Marine Corps	320	157	OCONUS
Misawa AFB	Air Force	421	322	OCONUS
Kitzingen	Army	446	367	OCONUS
Ft. Lee	Army	630	498	CONUS
Tyndall AFB	Air Force	433	323	CONUS
San Diego - Sub Base	Navy	203	153	CONUS
San Diego - Naval Station	Navy	311	257	CONUS
Travis AFB	Air Force	433	333	CONUS
Total		16,378	12,395	
Remotes				
	Army	794	645	
	Navy	724	589	
	Air Force	657	501	
	Marine Corps	957	715	
Total		3,132	2,450	
OVERALL TOTAL		19,510	14,845	

RTI/6829/01-DR

Sampling Design for the DoD Fitness Project

Draft Final Report

Prepared by:

**Jun Liu
Vincent Iannacchione**

Contract Number: F49620-3-1-0586

**Submitted to:
Military Family Institute
Marywood University
2300 Adams Avenue
Scranton, PA 18509-1598**

August 19, 1997

CONTENTS

	<u>Page</u>
1. Introduction and Summary	1
2. Sampling Frames.....	3
2.1 Installation-Level Frame	3
2.2 Person-Level Frame	4
3. Sample Allocation	6
4. Sample Selection.....	8
5. Sampling Weights	12
6. Variance Estimation	13
7. References	17
Appendix A. Geographic Distribution of Nucleus Locations	A-1
Appendix B. Population and Sample Distributions	A-2

List of Tables

Table 1.	Distribution of Active Duty Personnel by Type of Duty Location.....	5
Table 2.	Size Constraints Used in the Optimal Sample Allocation	7
Table 3.	Precision Constraints Used in Optimal Allocation	9
Table 4.	Optimal Allocation of FSUs and Respondents by Second-Stage Strata within FSU.....	10
Table 5.	Response and Eligibility Assumptions Used in the DoD Fitness Survey Design.	11
Table 6.	Expected Distribution of the Spouse Survey.....	12
Table 7.	Primary Stratification for the DoD Fitness Project	16

Sampling Design for the DoD Fitness Project

1. Introduction and Summary

In this report, we describe the methodology used to develop and implement the sampling design for the Department of Defense (DoD) Fitness Project. Activities associated with the sampling design included the acquisition and construction of the sampling frames, the specification and allocation of the sample sizes, the sample selection procedures, and the calculation of sampling weights. In addition, we describe the estimation procedures that are needed to produce variance estimates that are consistent with the sampling design.

The Research Triangle Institute (RTI) is responsible for the sampling design. Throughout the development of the sampling design, RTI worked closely with the Fitness Project's Principal Investigator and other staff members at the Military Family Institute (MFI) to ensure that the Project's analytical requirements and resource constraints were incorporated into the design.

The *target population* for the DoD Fitness Project includes all military personnel in pay grades E2 or higher who are on active duty at the time of data collection (expected to begin in September, 1997) except those who are absent without leave (AWOL), incarcerated, or undergoing a permanent change of station. Spouses of eligible personnel also are included in the target population.

A primary objective of the sampling design is to facilitate the planned on-site group administration of the survey questionnaire to active-duty sample members whenever possible. (Spouses of active-duty sample members will be mailed a spouse questionnaire.) Although generally more costly than other modes of collecting data (e.g., mail or telephone), on-site data collection has distinct advantages in terms of increased response rates and quality of data. Because of the world-wide geographic distribution of military personnel, we developed a dual-mode sampling design that called for the survey instrument to be group-administered at large installations (where hundreds of sample members could be assembled), and mailed to persons in small remote locations.

The dual-mode approach to data collection allows us to maximize the cost effectiveness of on-site data collection while retaining complete coverage of the survey population. In addition, we used stratification to control the sample distribution with respect to organizational and demographic characteristics. Similar to the design used for the *1995 DoD Survey of Health Related Behaviors Among Military Personnel* (Bray et al 1995), this approach allows the sample to achieve cost efficiency while preserving the inferential capability of the sample.

During the construction of the sampling frame, we identified 346 military installations where 500 or more active-duty persons were stationed. These so-called "nucleus" installations were deemed large enough to support the on-site administration of the survey to between 300 and 400 sample persons. Approximately 91 percent of all active-duty personnel were found to be stationed at or within 20 miles of a

nucleus site. The remaining nine percent of persons were deemed to be "remote" and subject to the mail survey.

Systematic nonresponse to the survey may introduce bias into the survey estimates. For example, the results of the 1995 DoD Survey indicate that most of the nonrespondents to the group administrations did not attend because they were away from their duty station either on routine temporary duty (TDY) or on leave. If physical fitness routines and other health-related behaviors change when a member is away from home, then the corresponding prevalence estimates of these measures may be biased because of the systematic exclusion of members who are away. To help ensure that all eligible persons have an opportunity to participate in the survey, the sampling design specifies that all sample members who do not attend the group administrations be mailed a copy of the questionnaire as part of the non-response follow-up. Similarly, multiple mailings of the questionnaire are specified for persons in remote locations.

We selected a total of 19,906 active-duty members for the DoD Fitness Project sample. Of these, 16,775 will be asked to attend group administrations at 37 different installations around the world. The remaining 3,131 active-duty members as well as 15,369 spouses of sample members will be mailed a survey questionnaire. We determined these sample sizes by using optimization techniques to balance the Project's analytical requirements with available fiscal resources. Statistical precision requirements were specified by MFI for subpopulations considered important for the analysis. These included Service, gender, rank (i.e., officer or enlisted), marital status, and the presence of children under 18 years of age. Applying the eligibility and response rates realized for the 1995 DoD Survey, we expect approximately 11,457 active-duty members and 8,826 spouses to participate in the survey.

The sample members for the group administrations were selected in two stages. At the first stage, 37 installations were selected with probabilities proportional to the weighted number of persons assigned to each installation. Because of their large size, six of the installations were included in the sample with certainty: Fts. Bragg and Hood for the Army, Norfolk and San Diego Naval Stations for the Navy, and Camps Lejeune and Pendleton for the Marine Corps. In addition, a total of 12 installations were selected as replacements in the event that an originally selected installation is unable to participate in the survey. The sample of installations was stratified by Service, CONUS/OCONUS location, and, for the Navy, afloat designation.

After the sample was selected, we computed a sampling weight for each sample member to reflect his/her selection probability. Sampling weights may be viewed as inflation factors that account for the number of persons in the survey population that a sample member represents. The sum of the sampling weights across all active-duty sample members is 1,287,843. This sum estimates the number of persons with a positive probability of being selected into the sample including those who will be separating or transferring around the time of data collection (i.e., ineligible persons). After data collection, the sampling weights should be adjusted for differential eligibility and response among the sample members. The sum of the adjusted weights will estimate the actual size of the target population at data collection.

2. Sampling Frames

2.1 Installation-Level Frame

We began construction of the installation-level frame by obtaining a data file of counts of active-duty members by duty Zip code and military unit (as identified by the Unit Identification Code (UIC)) created from the September, 1996 versions of the Active Duty Master File (ADMF) and the Defense Enrollment Eligibility Reporting System (DEERS) maintained by the Defense Manpower Data Center (DMDC). The data file contained 26,582 unique Zip-UIC combinations that accounted for 1,456,809 persons. We identified and discarded 979 records (13,740 persons) with incomplete or unusable data. (Most of these had a Zip of '00000' which we know from prior experience to be persons undergoing a PCS to Europe.) We also identified and discarded 376 records (7,232 persons) with inactive APO/FPO numbers. With the removal of the discarded records, the sampling frame accounted for 98.6% of the total persons provided.

We used the personnel counts to geographically partition the active-duty population into three categories:

- Persons who were stationed at an installation with 500 or more persons (called a "nucleus" installation);
- Persons whose duty station was within 20 miles of a nucleus installation; and
- Persons whose duty station was more than 20 miles from a nucleus installation.

This partitioning of the population was done to facilitate the dual-mode approach to data collection. Specifically, persons stationed at or within 20 miles of a nucleus installation were eligible for the on-site administration of the survey, while other persons were eligible for the mail administration of the survey. For the group-administered portion of the sample, installations are considered first-stage sampling units (FSUs) and persons are second-stage sampling units (SSUs). For the mail administered portion, persons are FSUs because they are selected directly.

To define a distinct geographic location, we used 5-digit Zip codes of duty locations in CONUS, Army Post Office (APO) and Fleet Post Office (FPO) numbers in OCONUS, and Navy geo-location codes to identify the home ports of Naval afloat units. We identified 346 installations where 500 or more active-duty persons were stationed. These nucleus installations accounted for more than 1.2 million persons or 88 percent of the active-duty population. The world-wide geographic distribution of the nucleus installations is shown in *Appendix A*.

Six of the 346 nucleus installations on the sampling frame were large enough to be designated as *self-representing*: Ft. Bragg and Hood for the Army, Norfolk and San Diego Naval Stations for the Navy, and Camps Lejuene and Pendleton for the Marine Corps. Because hundreds of operational units are housed at these large installations, the coordination and notification of sample members could be time consuming and burdensome. Therefore, we limited the number of units tasked to participate in the survey at large installations by subdividing them into clusters of units that satisfy the minimum size requirement

and then treating them as a separate FSUs.

Persons stationed within 20 miles of a nucleus installation were assumed to be close enough to attend the group administrations of the survey questionnaire. To identify these "satellite" locations, we computed the distance between the geometric centroid of each duty Zip with fewer than 500 persons and the centroid of each nucleus Zip. Duty Zips that were within 20 miles of a nucleus were deemed satellite locations and associated with the nucleus to form an FSU. When a duty Zip was within 20 miles of two or more nucleus Zips (e.g., the Washington DC area), the Zip was associated with the closest nucleus. Approximately 47,000 persons (3.3 percent of the population) were stationed at satellite locations.

Person stationed more than 20 miles from any nucleus installation assumed to be too far away to attend the group administrations. Persons stationed in these "remote" locations were instead eligible for the mail administration of the questionnaire. We identified approximately 126,000 such persons (8.8 percent of the active-duty population).

In addition to Service, we stratified the installation frame was stratified by region of the world (i.e., CONUS versus OCONUS) and, for Naval units, afloat status. These strata were used to control the worldwide distribution of the sample, an important cost consideration. *Table 1* shows the distribution of active-duty personnel by Service, type of duty location, and region of the world.

2.2 Person-Level Frame

We selected the sample of 37 installations for the group administrations in March, 1997 from the installation-level frame based on the September, 1996 distribution of active-duty personnel. Although individuals frequently transfer in and out of units, the timeliness of the installation frame was not essential at this stage because an installation's total strength was likely to remain fairly static. Timeliness does become essential at the second stage when individuals are selected. Therefore, we developed specifications for DMDC to use the May, 1997 versions of the ADMF and DEERS, the most current personnel files available at the time, to select stratified samples of active-duty personnel stationed at (or within 20 miles of) the 37 selected installations and at remote locations. The person-level frame was stratified by the 12 cross-classifications of gender, rank (i.e., officer and enlisted), and family status (i.e., has children, married no children, and other). The strata were used to control the sample distribution of active-duty members and their spouses to meet the precision requirements described in the next section.

Table 1. Distribution of Active Duty Personnel by Type of Duty Location

	Type of Duty Location			Total	
	Nucleus ¹	Satellite ²	Remote ³		
	%	%	%	% (%)	
Army					
CONUS	329,848	6,620	18,759	355,227	
OCONUS	84,211	10,934	21,933	117,078	
	414,059	(87.7)	17,554	(3.7)	40,692 (8.7) 472,305 (100.0)
Navy					
CONUS	157,830	10,217	20,721	188,768	
OCONUS	23,710	5,043	4,289	33,042	
Afloat ⁴	161,083	3,107	24,401	188,591	
	242,623	(59.3)	18,367	(4.5)	49,411 (12.0) 410,401 (100.0)
Marine Corps					
CONUS	124,395	3,225	18,312	145,932	
OCONUS	21,016	120	2,834	239,970	
	145,411	(85.6)	3,345	(2.0)	21,146 (12.4) 169,902 (100.0)
Air Force					
CONUS	284,991	5,143	7,865	297,999	
OCONUS	67,792	2,558	6,575	76,925	
	352,783	(94.1)	7,701	(2.0)	14,440 (3.9) 374,924 (100.0)
Total	1,254,876	(87.9)	46,967	(3.3)	125,689 (8.8) 1,427,532 (100.0)

Source: September, 1996 Active Duty Master File.

¹ Nucleus: Duty location with 500 or more persons on active duty.

² Satellite: Duty location with 20 miles of a nucleus location.

³ Remote: Duty location more than 20 miles from a nucleus location.

⁴ The duty location of afloat units is their homeport.

3. Sample Allocation

The sample allocation problem can be stated in terms of determining the number of installations, active-duty members, and spouses such that the precision requirements set for the survey are met for the least cost. That is, the sample sizes determined by the sampling design are a balance between satisfying analytical requirements of the survey and the fiscal constraints imposed on the survey.

We set up a nonlinear optimization problem using the Kuhn-Tucker conditions (Chong and Zak, 1995) to search for the optimal sample size and allocation. For a design like the DoD Fitness Project where sampling units at each stage can be assumed to be selected with equal probability and with replacement, the variance of the estimated proportion p_d from domain d can be expressed as:

where

- N_i is the total number of individuals in the i^{th} first-stage stratum.
- N_d is the size of the d^{th} domain in the total population.
- σ_{di}^2 is the first-stage stratum level population variance of the binomial proportion p_{di} , where p_{di} is the relative size of the d^{th} domain in the i^{th} first-stage stratum).
- σ_{dij}^2 is the population variance of the binomial proportion p_{dij} , where p_{dij} is the relative size of the d^{th} domain defined within the j^{th} second stage stratum, in the i^{th} first-stage stratum.
- ρ_i is the intraclass correlation among individuals in the same FSU averaged over the FSUs in the frame in the i^{th} first-stage stratum.

As one can see, the variance formula depends on the first and second stage sample size n_{li} and n_{2ij} . We also can formulate the cost function for the variable cost of the survey in terms of n_{li} and n_{2ij} as

$$C = \sum_{i=1}^s \{ c_{li} n_{li} + \sum_{j=1}^{l_2} c_{2ij} n_{2ij} \}.$$

well:

where c_{li} and c_{2ij} are the variable cost associated with adding an additional first- and second-stage sampling unit, respectively.

If we denote the precision requirement for the sample proportion from the d^{th} domain as K_d , the sample allocation problem can then be formulated as minimizing the cost function (2) subject to the following constraints:

$$\text{Var}(p_d) \leq K_d, \quad d = 1, 2, \dots, D,$$

$$n_{ii} \geq 0, \quad n_{2ij} \geq 0, \quad \text{for } i = 1, 2, \dots, 8, \quad j = 1, 2, \dots, 12,$$

and,

where D is the number of domains under consideration. In addition to the constraints in (2) and (3), we imposed the practical limitations that are listed in Table 2. For example, we set an upper limit on the number of second-stage units (active duty members) to select from an installation so that the group sessions would not become unmanageable.

Table 2. Size Constraints Used in the Optimal Sample Allocation

Constraints	Service	Target	Achieved
Number of FSUs			
Minimum Number of FSUs per 1 st Stage Stratum \leq	DoD	2	2
Total Number of FSUs \geq	DoD	60	37
Maximum Number of FSUs per Service \leq	DoD	20	10
Number of SSUs per Second-Stage Stratum			
Minimum Number of SSUs per FSU \geq	DoD	200	213
Maximum Number of SSUs per FSU \leq	DoD	300	294
Minimum Number of SSUs per 2 nd Stage Stratum \geq	DoD	3	3
Minimum Number of Female SSUs per 2 nd Stage Stratum \geq	DoD	1	3
Minimum Number of SSU in Spouse Survey per 2 nd Stage Stratum \geq	DoD	450	496
Number of Females per FSU			
Total Number of Female Officers per FSU \leq	Army	10	9
	Navy	10	9
	Marine Corps	10	9
	Air Force	15	12
Total Number of Female Enlisted per FSU \leq	Army	150	114
	Navy	150	118
	Marine Corps	75	52
	Air Force	150	109

We used sample estimates on the variable Strenuous Excises from the 1995 DoD Survey of Health Related Behaviors Among Military Personnel to supply the binomial proportions needed to compute values of the variance components σ^2 's. Intraclass correlations ρ_i were set at 0.0007 based on historical estimates from DoD surveys. The precision requirements used in the allocation are given in *Table 3*. The initial sample allocation obtained by solving the constrained non-linear optimization problem using the Kuhn-Tucker necessary conditions is shown in *Table 4*.

For certain rare domains, the sample size per FSU given by the optimal allocation algorithm could exceed the population size. For example, in many selected FSUs, the number of female officers who are married and have children are fewer than the allocated sample size. This is especially true for the Marine Corps. In this situation, we adjusted the sample sizes so that they were always smaller than the corresponding population sizes. However, the constant changes in personnel assignment and family status makes it impossible to know the exact population sizes in each of the second-stage stratum, either at FSU level or at the population level. As a result, the targeted sample sizes were not met in some FSUs even after the adjustment.

The selection of certainty FSUs required us to make adjustments to the second-stage sample size. Given the fixed number of second-stage sampling units to be selected from each service/cost stratum, we allocated the SSUs to the certainty FSUs according to their composite size measures. Then, we allocated the remaining SSUs in the cost stratum equally among the remaining selected FSUs in the stratum. The resulting sample sizes for the second-stage strata were slightly different from the initial allocation. Prior to finalizing the sample allocations, we made further adjustments to account for the anticipated ineligibility and non-responses. These are documented in the next section. The final sample sizes by the second-stage strata are given in *Appendix B*.

4. Sample Selection

Before sample selection, we first calculated the composite size measure for the k^{th} FSU in the i^{th}

$$S_{ik} = \sum_{j=1}^{I_2} f_{ij} N_{ijk}, \quad \text{for } k = 1, 2, \dots, n_{ii}, \quad i = 1, 2, \dots, 8,$$

first-stage stratum as following:

where

f_{ij} is the sampling rate for the j^{th} second stage stratum within the i^{th} first-stage stratum,

N_{ijk} is the population total of the j^{th} second stage stratum within the k^{th} FSU, in the i^{th} first-stage stratum.

Given the size measure S_{ik} , the selection probability of the k^{th} FSU in the i^{th} first-stage stratum can be

$$\pi_{ik} = n_{ii} \frac{S_{ik}}{S_{i+}}, \quad \text{for } k = 1, 2, \dots, n_{ii} \text{ and } i = 1, 2, \dots, 8,$$

calculated as

where n_{ii} is the number of FSUs selected from the i^{th} first-stage stratum and, $S_{i+} = \sum_k S_{ik}$ is the total size measure of all FSUs in the i^{th} first-stage stratum.

Table 3. Precision Constraints Used in Optimal Allocation*

	Army		Navy		Marine Corps		Air Force		Overall	
	Precision Required	Achieved Precision								
Males										
With Children	0.100	0.049	0.100	0.051	0.100	0.047	0.100	0.051	0.050	0.034
Married, No Child	0.100	0.049	0.100	0.051	0.100	0.048	0.100	0.052	0.050	0.034
Other	0.100	0.049	0.100	0.051	0.100	0.047	0.100	0.052	0.050	0.033
Overall	0.050	0.030	0.050	0.031	0.050	0.029	0.050	0.031	0.050	0.020
Females										
With Children	NA	0.150	0.073							
Married, No Child	NA	0.150	0.102							
Other	NA	0.150	0.086							
Overall	0.075	0.046	0.075	0.059	0.125	0.101	0.075	0.050	0.100	0.038
Males & Females										
With Children	0.050	0.043	0.050	0.046	0.050	0.044	0.050	0.045	0.050	0.030
Married, No Child	0.050	0.035	0.050	0.036	0.050	0.039	0.050	0.036	0.050	0.024
Other	0.050	0.042	0.050	0.044	0.050	0.044	0.050	0.042	0.050	0.028
Officers	0.050	0.047	0.050	0.050	0.050	0.043	0.050	0.050	0.050	0.034
Enlisted	0.050	0.030	0.050	0.030	0.050	0.030	0.050	0.031	0.050	0.020
Overall	0.050	0.026	0.050	0.027	0.050	0.027	0.050	0.027	0.025	0.018

* Precision is measured in terms of 95% confidence interval half width.

Table 4. Optimal Allocation of FSUs and Respondents by Second-Stage Strata within FSU

		Army		Navy		Marines		
		CONUS	OCONUS	CONUS	OCONUS	CONUS	OCONUS	
FSUs per Cost Stratum								
Males	<i>With Children</i>	Officers	24	7	21	13	44	32
		Enlisted	23	18	31	38	27	16
	<i>Married, No Children</i>	Officers	24	18	26	16	13	7
		Enlisted	29	30	41	61	36	19
	<i>Other</i>	Officers	4	4	7	6	4	3
		Enlisted	33	18	33	50	26	73
Females	<i>With Children</i>	Officers	4	3	4	3	4	4
		Enlisted	73	49	75	39	21	21
	<i>Married, No Children</i>	Officers	4	3	4	3	3	4
		Enlisted	31	49	32	39	21	20
	<i>Other</i>	Officers	4	4	4	4	3	3
		Enlisted	10	10	12	11	11	11
Summary								
<i>Total SSUs per Stratum</i>		1578	639	1450	1132	1704	426	
<i>Total SSUs per FSU</i>		263	213	290	283	213	213	
<i>Total Female Officers per FSU</i>		12	10	12	10	10	11	
<i>Total Female Enlisted per FSU</i>		114	108	119	89	53	52	
<i>Total Female / Male SSUs</i>		1110	1107	1051	1531	630	1500	
<i>Percent of Female / Male</i>		50.07%	49.93%	40.70%	59.30%	29.58%	70.42%	
<i>Total Officer / Enlisted</i>		314	2208	348	2573	331	2120	
<i>Percent of Officer / Enlisted</i>		12.45%	87.55%	11.91%	88.09%	13.50%	86.50%	
<i>Total Female Officer / Enlisted</i>		102	919	100	780	102	825	
<i>Percent of Officer / Enlisted</i>		9.99%	90.01%	11.36%	88.64%	11.00%	89.00%	
<i>SSUs in Spouse Survey</i>		674		769		496		
<i>FSUs / SSUs per Service</i>		9	2217	9	2582	10	2130	

Nucleus installations whose selection probabilities are close to or larger than 1 were considered as certainty FSUs and separate first-stage strata were created for them. Seven such FSUs were identified. To facilitate our selection routine and the actual implementation of the on site group session, exceedingly large FSUs (include all certainty FSUs) were split into smaller FSUs of size measure comparable to the average size measure and containing no more than 100 UICs. An independent sample then was drawn from each first-stage stratum with probability proportional to size (PPS) using Probability Minimum Replacement sample selection (Chromy 1979). In all, 16 FSUs were selected from the six certainty installations and 30 FSUs were selected from the rest of installations. An additional 12 FSUs were selected as alternate sample FSUs for substitution in the event that a primary installation is unable to participate in the survey. The sampled installations are listed in Appendix C.

The sample of active-duty members was selected from the May, 1997 version of the ADMF and DEERS files. In the four months between sample selection and data collection (currently planned for September, 1997), a portion of the sample members are expected to become ineligible for the survey because they will undergo a permanent change of station (PCS), separate from the Service, or become absent without leave (AWOL). We inflated the sample sizes to account for the likely reduction in sample yield using the eligibility rates found in the 1995 DoD Survey of Health Related Behaviors among Military Personnel. These rates are presented in *Table 5*.

Table 5. Response and Eligibility Assumptions Used in the DoD Fitness Survey Design

Service		Army	Navy	Marine	Air Force	DoD
Assumed Eligibility Rate		77.4%	86.6%	87.6%	92.4%	85.7%
Assumed Response Rate*	Mail Survey	53.2%	58.2%	43.8%	64.2%	56.1%
	Group Session	64.9%	67.4%	70.0%	76.5%	69.6%

* Response rate is defined as the percent of eligible sample members who participated in the survey.

Non-response is inevitable for a survey of the scale and complexity of the DoD Fitness Project. To compensate for the anticipated non-response, we inflated the second-stage sample sizes to help attain the desired analysis domain sizes. The assumed response rates were obtained from the 1995 DoD Survey of Health Related Behaviors among Military Personnel and are presented in Table 5. Using the inflated sample sizes for each second-stage stratum within each FSU, we selected independent stratified random samples of active duty members within each FSU.

Unlike persons eligible for the group administrations, persons stationed at remote locations were selected directly as first-stage sampling units (FSUs). The sample sizes were again inflated by the anticipated non-response rates and ineligibility rates in order to obtain approximately 400 eligible respondents from each Service. The assumed response rates were based on the 1995 Status of Armed Forces Surveys (Mason et al 1996) which was a mail survey consisting of a notification letter and two mailings of the questionnaire. A stratified random sample (SRS) of active members stationed in remote locations was drawn independently for each service. The sampling rates used in each stratum were the same as the overall sampling rates for the group-administered sample.

Overall, we selected a total of 19,906 active duty members and 15,369 spouses for the survey. (Another 6,618 active members were selected from the alternate FSUs.) If our assumptions about response and eligibility rates are correct, we expect 11,457 active members and 7,234 spouses to be eligible respondents to the survey. Distributions of the selected members and the expected respondents are presented in *Appendix A*.

Table 6. Expected Distribution of the Spouse Survey

	Army	Navy	Marines	Air Force	DoD
Number of Selected Spouses *	4,522	4,109	3,326	3,412	15,369
Expected Number of Respondents	1,863	2,071	1,277	2,023	7,234

* Marital status as of May, 1997.

5. Sampling Weights

We calculated initial sampling weights as the inverse of the probability of selection at each stage of the design. At the first-stage, the expected frequency of selecting the k^{th} FSU in the i^{th} first-stage stratum is given by the selection probability in (6). At the second stage, we selected a simple random sample of active duty members from each gender, family status and rank group with sampling rates that attained the desired domain sizes. In addition, we made the overall selection probabilities assigned to members in the same first- and second-stage strata equal whenever possible. The probability of selecting the l^{th} member from the j^{th} second-stage stratum (gender, family status and rank group) within the k^{th} FSU in the i^{th} first-stage stratum is given by

$$\pi_{ijkl} = \min\left(1, \frac{n_{2ij}}{N_{ijk}}\right), \quad \text{for } i=1,2,\dots,8, j=1,2,\dots,12, k=1,2,\dots,n_{li}, l=1,2,\dots,n_{2ij},$$

where n_{li} is the number of FSUs selected from the i^{th} first-stage stratum, n_{2ij} is the number of SSUs selected from the j^{th} second-stage stratum within the i^{th} first-stage stratum, and N_{ijk} is the population size of the j^{th} second-stage stratum within the k^{th} FSU in the i^{th} first-stage stratum.

Thus, combining (6) and (7) and using the same notation, the initial sampling weight for the l^{th}

$$w_{ijkl} = \frac{l}{\pi_{ik} \pi_{ijkl}}, \quad \text{for } i=1,2,\dots,8, j=1,2,\dots,12, k=1,2,\dots,n_{li}, l=1,2,\dots,n_{2ij}.$$

member from the j^{th} second-stage stratum within the k^{th} FSU in the i^{th} first-stage stratum is given by

The sampling weights for members in the same second-stage stratum within the same FSU were likely to be a constant, except in rare cases where $n_{2ij} / N_{ijk} \geq 1$, that is, when the allocated sample size for the domain was larger than the actual population size. For members who were selected from remote installations, the weight calculated in (8) is the inverse of the first-stage selection probability given by (6), since probability of the second-stage selection is 1 (no second-stage selection). We assigned this weight to each of the 19,906 active duty members selected in the sample. The weights sum up to 1,287,843, the estimated total active duty members excluding those at pay grade of E1 as of May, 1997.

Again, we emphasize that this weight was calculated based on information which could be inaccurate at the time of the survey given the ever-changing assignment and family status of the active duty members. To reflect the sample design and real situation accurately, and to produce unbiased estimates, certain adjustments have to be made to the initial sampling weights in (8). These include, but not limited to, eligibility adjustments, non-response adjustments and post-stratification adjustments.

6. Variance Estimation

The sample selected for the DoD Fitness Project is not a simple random sample. It is a multi-stage, stratified random sample that used widely varying sampling rates for sample selection and will be subject to varying degrees of eligibility and participation. The sampling weights described in the previous section account for the differential sampling rates, and when adjusted for nonresponse, will enable nearly unbiased estimates of population parameters. However, the sampling design also has a significant impact on the sampling variances of the survey estimates (Cochran 1977).

Most major statistical software packages (e.g., SAS, SPSS, or BMDP) are able to compute weighted means, prevalence rates, and regression coefficients. However, these same packages either ignore, or do not properly take into account, the sampling design when computing the variances of these statistics. Usually, the variances that accompany the weighted estimates are too small because they ignore the variance inflation that accompanies unequal weighting. As a result, analysts who plan to use the Fitness Project data files should plan to use the appropriate statistical software.

The two most widely-known techniques for estimating the variances of statistics derived from complex survey designs are Taylor Series linearization and replication methods (Cochran 1977). In most situations, both techniques produce similar results although the Taylor Series approach requires less set-up time and is easier to use. Statistical software packages are available for both variance estimation techniques. Two examples are the SUDAAN software package developed by RTI (Shah et al 1997) which offers both Taylor Series linearization and replication methods, and the WESVAR software developed by Westat, Inc. (Brick et al. 1996) which offers several replication methods including balanced repeated replications (BRR) and the jackknife method.

In addition to the adjusted sampling weight, these variance estimation methods require that the primary clusters (i.e. FSUs) and primary strata be specified. For the Fitness Project, installations are the FSUs for the group-administered portion of the survey and persons are the FSUs for the mail portion of the survey. The primary strata are defined by the intersection of Service, cost stratum, and certainty status for the group-administered portion of the survey, and the intersection of gender, rank, and family status for the mail-administered portion. The distribution of FSUs by primary strata are listed in *Table 7*.

Table 7. Primary Stratification for the DoD Fitness Project

Service	Cost Strata	Certainty Selection	Number of FSUs	STRATUM ID
Army	CONUS	None	4	1100
	OCONUS	None	3	1200
	Remote	None	794*	1301 - 1312
	CONUS	Ft Bragg, NC	2	1400
	CONUS	Ft Hood, TX	2	1500
Navy	CONUS	None	3	2100
	OCONUS/Afloat	None	3	2200
	Remote	None	724*	2301 - 2312
	CONUS	NB, Norfolk, VA	2	2400
	CONUS	NB, San Diego, CA	2	2500
Marine Corps	Afloat	NB, Norfolk, VA	2	2600
	CONUS	None	6	3100
	OCONUS	None	2	3200
	Remote	None	956*	3301 - 3312
	CONUS	CP Lejuene, NC	3	3400
Air Force	CONUS	None	7	4100
	OCONUS	None	2	4200
	Remote	None	657*	4301 - 4312

* Initial sample size.

7. References

- Bray R.M., L.A. Kroutil, S.C. Wheless, M.E. Marsden, S.L. Bailey, J.A. Fairbank, T.C. Harford (1996). *1995 Department of Defense Survey of Health Related Behaviors Among Military Personnel*, Prepared for the Assistant Secretary of Defense (Health Affairs), RTI Report 6019/06-FR.
- Brick, J.M., P. Broene, P. James, and J. Sevynse (1996). *A User's Guide to WesVarPC*, Westat, Inc., Rockville, MD.
- Chong, E.K.P., and S.H. Zak (1996). *An Introduction to Optimization*. John Wiley & Sons, New York.
- Chromy, J.R. (1979). "Sequential Sample Selection Methods," *Proceedings of the Survey Research Section, American Statistical Association*, pp.401-406.
- Cochran, W.G. (1977). *Sampling Techniques*. John Wiley & Sons, New York.
- Mason, R.E., J.D. Kavee, S.C. Wheless, and B.J. George (1996). *Analytic Planning for the 1994/1995 Status of the Armed Forces Survey*, Prepared for the Defense Manpower Data Center, RTI Report 5827/104-01D.
- Shah, B.V., B.G. Barnwell, and G.S. Bieler (1997). *The SUDAAN User's Manual, Release 7.50*. Research Triangle Institute, NC.

Appendix A

Geographic Distribution of Nucleus Locations

(Note: Maps were omitted for this report)

Appendix B

Population and Sample Distributions

Table B-1. Population Counts from the September, 1996 DMDC Personnel Files*

		Army			Navy			Marine Corps			Air Force			DoD		
		CONUS	OCONUS	Overall	CONUS	OCONUS	Overall	CONUS	OCONUS	Overall	CONUS	OCONUS	Overall	CONUS	OCONUS	Overall
Males	<i>With Children</i>															
	Officers	28,927	8,185	37,092	15,052	10,139	25,191	7,411	1,252	8,663	28,872	5,000	33,872	80,262	24,556	104,818
	Enlisted	123,604	43,098	166,702	62,192	79,213	141,405	37,947	6,876	44,823	100,520	31,371	131,891	324,263	160,558	484,821
	Overall	152,531	51,263	203,794	77,244	89,352	166,996	45,356	8,128	53,486	129,392	38,371	165,783	404,525	185,114	589,639
	<i>Married, No Children</i>															
	Officers	12,417	3,708	16,125	7,463	5,150	12,813	3,812	470	4,082	13,174	2,194	15,388	38,866	11,522	48,188
	Enlisted	35,886	13,389	49,275	19,438	30,815	50,053	19,580	3,411	22,991	36,673	10,782	47,455	111,577	58,197	169,774
	Overall	48,303	17,087	65,400	26,901	35,765	62,866	23,192	3,681	27,073	49,847	12,976	62,823	148,243	69,719	217,962
	<i>Other</i>															
	Officers	9,186	3,468	12,652	6,746	5,190	11,936	3,843	428	4,071	10,744	1,518	12,260	30,319	10,600	40,919
	Enlisted	94,974	28,926	123,900	45,494	72,838	118,332	62,856	14,080	76,846	57,334	14,513	71,847	260,858	130,367	391,025
	Overall	104,160	32,392	136,552	52,240	78,028	130,268	66,499	14,518	81,017	68,078	16,029	84,107	290,977	140,967	431,944
	<i>Overall</i>															
	Officers	50,530	15,339	65,869	29,261	20,479	49,740	14,666	2,150	16,818	52,790	8,710	61,500	147,247	46,878	193,925
	Enlisted	254,464	85,413	339,877	127,124	182,668	309,790	120,383	24,377	144,760	194,527	56,866	251,193	696,498	349,122	1,045,620
	Overall	304,994	100,752	405,746	156,385	203,145	359,530	135,049	26,527	161,576	247,317	65,376	312,693	843,745	395,800	1,239,545
Females	<i>With Children</i>															
	Officers	2,509	581	3,090	1,866	397	2,063	136	25	161	2,851	425	3,276	7,162	1,428	8,590
	Enlisted	17,301	6,158	23,457	8,137	5,121	13,258	1,591	287	1,878	12,742	3,445	16,187	39,771	15,009	54,780
	Overall	19,810	6,737	26,547	9,803	5,518	15,321	1,727	312	2,039	15,593	3,870	19,463	46,933	16,437	63,370
	<i>Married, No Children</i>															
	Officers	2,435	669	3,104	1,832	591	2,423	205	30	235	3,330	530	3,860	7,802	1,820	9,622
	Enlisted	8,074	3,011	11,085	6,423	3,485	9,908	1,875	291	1,966	12,345	3,329	15,674	28,517	10,116	38,633
	Overall	10,509	3,680	14,189	8,255	4,076	12,331	1,880	321	2,201	15,675	3,859	19,534	38,318	11,936	48,255
	<i>Other</i>															
	Officers	2,681	993	3,674	2,413	952	3,365	303	34	337	3,660	681	4,351	9,057	2,870	11,727
	Enlisted	17,204	5,002	22,206	11,912	7,946	19,858	3,151	598	3,749	15,737	3,481	19,218	48,004	17,027	65,031
	Overall	19,885	5,995	25,880	14,325	8,898	23,223	3,454	632	4,086	19,397	4,172	23,569	57,061	19,697	76,758
	<i>Overall</i>															
	Officers	7,625	2,243	9,868	5,911	1,940	7,851	644	89	733	9,841	1,646	11,487	24,021	5,918	29,939
	Enlisted	42,579	14,169	56,748	26,472	16,552	43,024	6,417	1,176	7,593	40,824	10,255	51,079	116,292	42,152	158,444
	Overall	50,204	16,412	66,816	32,383	18,492	50,875	7,061	1,265	8,326	50,665	11,901	62,566	140,313	48,070	188,383
Overall	<i>With</i>															
	Officers	31,438	8,746	40,182	16,718	10,538	27,254	7,547			31,723	5,425	37,148	87,424	25,884	113,408
	Enlisted	140,905	49,254	190,159	70,328	84,334	154,683	39,538	7,163	46,701	113,262	34,816	148,078	364,034	175,567	539,601
	Overall	172,341	58,000	230,341	87,047	94,870	181,917	47,085	8,440	55,525	144,985	40,241	185,226	451,458	201,551	653,009
	<i>Married, No Children</i>															
	Officers	14,852	4,377	19,229	9,295	5,741	15,036	3,817	500	4,317	16,504	2,724	19,228	44,468	13,342	57,810
	Enlisted	43,960	16,400	60,360	25,861	34,100	59,981	21,255	3,702	24,957	49,018	14,111	63,129	140,094	68,313	208,407
	Overall	58,812	20,777	79,589	35,156	39,841	74,997	25,072	4,202	29,274	65,522	16,835	82,357	184,562	61,655	266,217
	<i>Other</i>															
	Officers	11,867	4,459	16,326	9,159	6,142	15,301	3,946	462	4,408	14,404	2,207	16,611	39,376	13,270	52,846
	Enlisted	112,178	33,928	148,106	57,406	60,784	138,190	66,007	14,688	80,695	73,071	17,984	81,065	308,662	147,394	456,056
	Overall	124,045	38,387	162,432	66,565	66,926	153,491	69,953	15,150	85,103	87,475	20,201	107,676	348,038	160,664	508,702
	<i>Overall</i>															
	Officers	58,155	17,582	75,737	35,172	22,419	57,591	15,310	2,239	17,549	62,631	10,358	72,987	171,268	52,596	223,864
	Enlisted	297,043	99,582	396,625	153,596	199,218	352,814	128,800	25,553	152,353	235,351	66,921	302,272	812,790	391,274	1,204,064
	Overall	355,198	117,164	472,362	188,768	221,837	410,405	142,110	27,792	169,902	297,982	77,277	375,259	984,058	443,870	1,427,928

*Population counts include the pay grade E1.

Table B-2 Listing of Sample Installations

Service	Location	FSU ID	FSU Name	Country	Nucleus	Number of Persons	Number of UICs
Primary Selections							
Army	CONUS	1110200	FT LEE, VA	US	23803	4,921	97
		1110262	FT STEWART, GA	US	31314	7,842	80
		1110342	FT CAMPBELL, KY	US	42223	7,139	75
		1110520	FT IRWIN, CA	US	92310	4,209	39
		1110211	FT BRAGG, NC	US	28307	6,398	98
		1110213	FT BRAGG, NC	US	28307	6,121	84
		1110411	FT HOOD, TX	US	76544	8,250	98
		1110414	FT HOOD, TX	US	76544	6,164	72
Army	OCONU	1120190	DARMSTADT	GE	09213	2,215	52
		1120220	KITZINGEN	GE	09244	3,507	53
		1120410	TRIPLEX AMC, HI	US	96862	2,487	35
Navy	CONUS	2110100	FT MEADE, MD	US	21230	1,556	53
		2110330	PENSACOLA, FL	US	32511	1,943	8
		2110411	NTC, GREAT LAKES, IL	US	60208	12,242	68
		2110171	NS, NORFOLK, VA	US	23511	4,631	32
		2110173	NS, NORFOLK, VA	US	23511	3,190	51
		2110470	SAN DIEGO, CA	US	92106	637	16
		2110510	NS, SAN DIEGO, CA	US	92136	6,267	63
Navy	OCONUS / Afloat	2120180	NAS, BARBERS PT, HI	US	96863	1,365	49
		2130090	NAS, NORTH IS, CA	US	96601	3,725	27
		2130370	YOKOSUKA	JA	96679	8,647	39
		2130292	NORFOLK, VA	US	09550	11,496	11
		2130293	NORFOLK, VA	US	09578	9,523	38
Marines	CONUS	3110021	MCAF, QUANTICO, VA	US	22134	2,325	57
		3110040	NS, NORFOLK, VA	US	23607	1,455	92
		3110052	MCAS, CHERRY POINT, NC	US	28533	2,963	32
		3110091	MCRD, PARRIS ISLAND, SC	US	29905	2,182	33
		3110150	MCAS, YUMA, AZ	US	85369	2,633	34
		3110193	MCAS, EL TORO, CA	US	92710	2,805	75
		3110063	MCB, CP LEJEUNE, NC	US	28542	6,734	25
		3110064	MCB, CP LEJEUNE, NC	US	28542	4,354	18
		3110066	MCB, CP LEJEUNE, NC	US	28542	4,830	7
		3110161	MCB, CP PENDLETON, CA	US	92055	3,571	83
		3110164	MCB, CP PENDLETON, CA	US	92055	3,831	17
		3110166	MCB, CP PENDLETON, CA	US	92055	4,527	30
Marines	OCONUS	3120033	MCBH, KANEOHE BAY, HI	US	96863	1,710	6
		3120070	111 MEF	JA	96606	1,625	39
Air Force	CONUS	4110040	DOVER AFB, DE	US	19902	3,992	33
		4110170	TYNDALL AFB, FL	US	32404	4,482	55
		4110210	PATRICK AFB, FL	US	32955	2,754	66
		4110390	TINKER AFB, OK	US	73190	6,716	85

Table B-2 Listing of Sample Installations

Service	Location	FSU ID	FSU Name	Country	Nucleus	Number of Persons	Number of UICs
Air Force	OCONUS	4110440	RANDOLPH AFB, TX	US	78150	4,310	87
		4110600	LUKE AFB, AZ	US	85309	5,251	50
		4110710	TRAVIS AFB, CA	US	94590	7,817	56
		4120010	RAMSTEIN	GE	09263	8,297	124
		4120140	MISAWA AB	JA	96319	2,873	30
Alternative Selections							
Army	CONUS	1110310	FT MCCLELLAN, AL	US	36265	3,300	69
		1110490	FITZSIMONS AMC, CO	US	80294	806	28
Navy	OCONUS	1120110	SORGHOF	GE	09252	2,777	45
		2110130	NSWC, DAHLGREN, VA	US	22448	1,080	34
	CONUS	2110460	MCB, CP PENDLETON, CA	US	92055	2,015	33
		2130030	CONCORD, CA	US	96679	1,321	17
Marines	CONUS	3110032	HENDERSON HALL, VA	US	22214	899	38
		3110130	FT LEONARD WOOD, MO	US	65473	645	6
	OCONUS	3120020	CP H M SMITH, HI	US	96861	630	20
Air Force	CONUS	4110330	SCOTT AFB, IL	US	62225	6,074	97
		4110380	LITTLE ROCK AFB, AR	US	72099	4,353	40
	OCONUS	4120110	HOWARD AFB	PAN	34061	2,053	55

Table B-3. Sample Distribution of Active Duty Members by First- and Second-Stage Strata

		Army				Navy				Marine Corps				Air Force				DoD				
		CONUS		OCONU	Remote	Overall	CONUS		OCONU	Remote	Overall	CONUS		OCONU	Remote	Overall	CONUS		OCONU	Remote	Overall	
<u>Males</u>																						
	<u>Married, Children</u>																					
	Officers	328	45	60	433	196	99	44	339	603	93	188	884	175	30	35	240	1302	267	327	1896	
	Enlisted	316	114	69	498	290	287	86	663	369	54	112	535	343	108	76	527	1318	563	343	2224	
	Overall	644	159	129	932	466	386	130	1002	972	147	300	1419	518	138	111	787	2620	830	670	4120	
	<u>Married, No Children</u>																					
	Officers	328	114	71	513	214	121	54	389	180	24	53	257	301	48	59	408	1023	307	237	1587	
	Enlisted	396	189	94	679	385	461	128	972	495	66	147	708	455	138	100	693	1731	854	467	3052	
	Overall	724	303	165	1192	599	582	180	1361	675	90	200	965	756	186	159	1101	2754	1161	704	4619	
	<u>Other</u>																					
	Officers	56	24	13	93	65	43	17	125	54	10	17	81	70	12	14	96	245	89	61	395	
	Enlisted	456	114	91	861	310	378	102	790	351	250	180	761	504	140	109	753	1621	882	462	2965	
	Overall	512	138	104	754	375	421	119	915	405	260	177	842	574	152	123	849	1866	971	523	3360	
	<u>Overall</u>																					
	Officers	712	183	144	1039	475	263	115	853	837	127	258	1222	546	90	108	744	2570	663	625	3858	
	Enlisted	1168	417	254	1839	985	1126	314	2425	1215	370	419	2004	1302	386	285	1973	4670	2299	1272	8241	
	Overall	1880	600	398	2878	1460	1389	429	3278	2052	497	677	3226	1848	476	393	2717	7240	2962	1897	12099	
<u>Females</u>																						
	<u>Married, Children</u>																					
	Officers	54	18	12	84	47	17	9	73	28	3	16	47	42	12	9	63	171	50	46	267	
	Enlisted	977	264	210	1451	618	219	149	986	269	28	95	392	602	148	134	884	2466	659	588	3713	
	Overall	1031	282	222	1535	665	236	158	1059	297	31	111	439	644	160	143	947	2637	709	634	3980	
	<u>Married, No Children</u>																					
	Officers	56	18	12	86	38	28	9	75	43	6	10	59	42	12	9	63	179	64	40	283	
	Enlisted	420	240	117	777	300	223	89	612	304	46	94	444	308	148	78	534	1332	657	378	2367	
	Overall	476	258	129	863	338	251	96	687	347	52	104	503	350	160	87	597	1511	721	418	2650	
	<u>Other</u>																					
	Officers	56	24	13	93	43	38	10	91	43	8	14	65	42	12	9	63	184	82	46	312	
	Enlisted	136	63	32	231	115	83	29	227	150	38	50	238	112	32	25	169	513	216	136	865	
	Overall	192	87	45	324	158	121	39	318	193	46	64	303	154	44	34	232	697	298	182	1177	
	<u>Overall</u>																					
	Officers	168	60	37	263	128	83	28	239	114	17	40	171	126	36	27	189	534	196	132	862	
	Enlisted	1533	567	359	2459	1033	525	267	1625	723	112	239	1074	1022	328	237	1587	4311	1532	1102	6845	
	Overall	1699	627	396	2722	1161	608	295	2084	637	129	279	1245	1148	364	264	1776	4845	1728	1234	7807	
	<u>Overall</u>																					
	<u>Married, Children</u>																					
	Officers	382	83	72	517	243	116	53	412	631	96	204	931	217	42	44	303	1473	317	373	2163	
	Enlisted	1293	378	279	1950	908	506	235	1649	638	82	207	927	945	256	210	1411	3784	1222	931	5937	
	Overall	1675	441	351	2467	1151	622	288	2061	1269	178	411	1858	1182	298	254	1714	5257	1539	1304	6100	
	<u>Married, No Children</u>																					
	Officers	384	132	83	596	252	149	63	464	223	30	63	316	343	80	68	471	1202	371	277	1850	
	Enlisted	816	429	211	1456	685	684	215	1584	799	112	241	1152	783	286	178	1227	3063	1511	845	5419	
	Overall	1200	561	294	2055	937	833	278	2048	1022	142	304	1468	1106	346	245	1698	4265	1682	1122	7269	
	<u>Other</u>																					
	Officers	112	48	26	186	108	81	27	216	97	18	31	146	112	24	23	159	429	171	107	707	
	Enlisted	592	177	123	892	425	461	131	1017	501	288	210	909	616	172	134	922	2134	1098	598	3830	
	Overall	704	225	149	1078	533	542	158	1233	598	306	241	1145	728	196	157	1081	2563	1269	705	4537	
	<u>Overall</u>																					
	Officers	876	243	181	1302	603	346	143	1092	951	144	298	1393	672	126	135	933	3104	859	757	4720	
	Enlisted	2701	984	613	4298	2018	1651	581	4250	1938	482	658	3078	2324	714	522	3560	8981	3831	2374	15186	
	Overall	3579	1227	794	5600	2621	1997	724	5342	2889	626	956	4471	2996	840	657	4493	12085	4690	3131	19906	

Table B-4. Expected Number of Respondents by First- and Second-Stage Strata

		Army			Navy			Marines			Air Force			DoD			
		CONUS	OCONU	Remote	Overall	CONUS	OCONU	Remote	Overall	CONUS	OCONU	Remote	Overall	CONUS	OCONU	Remote	Overall
Males	<i>With Children</i>																
	Officers	165	24	25	214	114	58	22	194	370	57	72	499	124	21	21	166
	Enlisted	159	61	28	248	169	167	43	379	226	33	43	302	242	76	45	363
	Overall	324	85	53	462	283	225	65	573	596	90	115	801	366	97	66	529
	<i>Married, No Children</i>																
	Officers	165	61	29	255	125	71	27	223	110	15	20	145	213	34	35	282
	Enlisted	199	101	39	339	225	269	64	558	304	40	58	400	322	98	59	479
	Overall	364	162	68	594	350	340	91	781	414	55	76	545	535	132	94	781
	<i>Other</i>																
	Officers	28	13	5	41	38	25	9	63	33	6	7	39	49	8	8	57
Females	Enlisted	229	61	37	290	181	221	51	402	215	153	61	368	356	99	65	455
	Overall	257	74	42	331	219	248	60	465	248	159	68	407	405	107	73	512
	<i>With Children</i>																
	Officers	358	98	59	456	277	154	58	431	513	78	99	591	388	63	64	449
	Enlisted	587	223	104	810	575	657	158	1232	745	226	160	971	920	273	169	1193
	Overall	945	321	163	1266	852	811	216	1663	1258	304	259	1562	1306	336	233	1642
	<i>Married, No Children</i>																
	Officers	27	10	5	42	27	10	5	42	17	2	6	25	30	8	5	43
	Enlisted	491	140	87	718	361	128	75	564	165	17	36	218	425	105	79	609
	Overall	518	150	92	760	388	138	80	606	182	19	42	243	455	113	84	652
	<i>Other</i>																
Overall	Officers	28	10	5	43	22	16	5	43	26	4	4	34	30	8	5	43
	Enlisted	211	128	48	387	175	130	45	350	186	28	36	250	218	105	46	369
	Overall	239	138	53	430	197	148	50	393	212	32	40	284	248	113	51	412
	<i>With Children</i>																
	Officers	83	33	15	116	74	48	15	122	69	11	15	80	90	24	15	114
	Enlisted	770	302	148	1072	603	308	135	909	443	68	91	511	722	233	140	955
	Overall	853	335	163	1188	677	354	150	1031	512	79	106	591	812	257	155	1069
	<i>Married, No Children</i>																
	Officers	193	71	34	298	147	87	32	266	136	19	24	179	243	42	40	325
	Enlisted	410	229	87	726	400	399	109	908	490	68	92	650	540	203	105	848
	Overall	603	300	121	1024	547	486	141	1174	626	87	116	829	783	245	145	1173
	<i>Other</i>																
Overall	Officers	56	26	10	92	63	47	14	124	59	11	12	82	79	16	13	108
	Enlisted	297	95	50	442	248	269	66	593	307	176	80	563	435	122	80	637
	Overall	353	121	60	534	311	316	60	707	366	167	92	645	514	138	93	745
	<i>With Children</i>																
	Officers	441	131	74	646	351	202	73	626	582	89	114	785	476	87	79	642
	Enlisted	1357	525	252	2134	1178	963	293	2434	1188	294	251	1733	1842	508	309	2457
	Overall	1798	656	326	2780	1529	1165	366	3060	1770	383	365	2518	2118	593	388	3099
	<i>Married, No Children</i>																
	Officers	192	34	30	258	141	68	27	238	387	59	78	524	154	29	28	209
	Enlisted	650	201	115	966	530	295	118	943	391	50	78	520	667	181	124	972
	Overall	842	235	145	1222	671	383	145	1179	778	109	157	1044	821	210	150	1181
	<i>Other</i>																
Overall	Officers	193	71	34	298	147	87	32	266	136	19	24	179	243	42	40	325
	Enlisted	410	229	87	726	400	399	109	908	490	68	92	650	540	203	105	848
	Overall	603	300	121	1024	547	486	141	1174	626	87	116	829	783	245	145	1173
	<i>With Children</i>																
	Officers	193	71	34	298	147	87	32	266	136	19	24	179	243	42	40	325
	Enlisted	410	229	87	726	400	399	109	908	490	68	92	650	540	203	105	848
	Overall	603	300	121	1024	547	486	141	1174	626	87	116	829	783	245	145	1173
	<i>Married, No Children</i>																
	Officers	193	71	34	298	147	87	32	266	136	19	24	179	243	42	40	325
	Enlisted	410	229	87	726	400	399	109	908	490	68	92	650	540	203	105	848
	Overall	603	300	121	1024	547	486	141	1174	626	87	116	829	783	245	145	1173
	<i>Other</i>																
Overall	Officers	56	26	10	92	63	47	14	124	59	11	12	82	79	16	13	108
	Enlisted	297	95	50	442	248	269	66	593	307	176	80	563	435	122	80	637
	Overall	353	121	60	534	311	316	60	707	366	167	92	645	514	138	93	745
	<i>With Children</i>																
	Officers	441	131	74	646	351	202	73	626	582	89	114	785	476	87	79	642
	Enlisted	1357	525	252	2134	1178	963	293	2434	1188	294	251	1733	1842	508	309	2457
	Overall	1798	656	326	2780	1529	1165	366	3060	1770	383	365	2518	2118	593	388	3099
	<i>Married, No Children</i>																
	Officers	193	71	34	298	147	87	32	266	136	19	24	179	243	42	40	325
	Enlisted	410	229	87	726	400	399	109	908	490	68	92	650	540	203	105	848
	Overall	603	300	121	1024	547	486	141	1174	626	87	116	829	783	245	145	1173
	<i>Other</i>																
Overall	Officers	56	26	10	92	63	47	14	124	59	11	12	82	79	16	13	108
	Enlisted	297	95	50	442	248	269	66	593	307	176	80	563	435	122	80	637
	Overall	353	121	60	534	311	316	60	707	366	167	92	645	514	138	93	745
	<i>With Children</i>																
	Officers	193	71	34	298	147	87	32	266	136	19	24	179	243	42	40	325
	Enlisted	410	229	87	726	400	399	109	908	490	68	92	650	540	203	105	848
	Overall	603	300	121	1024	547	486	141	1174	626	87	116	829	783	245	145	1173
	<i>Married, No Children</i>																
	Officers	193	71	34	298	147	87	32	266	136	19	24	179	243	42	40	325
	Enlisted	410	229	87	726	400	399	109	908	490	68	92	650	540	203	105	848
	Overall	603	300	121	1024	547	486	141	1174	626	87	116	829	783	245	145	1173
	<i>Other</i>																
Overall	Officers	56	26	10	92	63	47	14	124	59	11	12	82	79	16	13	108
	Enlisted</td																

REPORT DOCUMENTATION PAGE

*Form Approved
OMB No. 0704-0188*

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

1. AGENCY USE ONLY (Leave Blank)			2. REPORT DATE September 1998		3. REPORT TYPE AND DATES COVERED Final January 1996 - September 1998	
4. TITLE AND SUBTITLE Physical Activity Patterns and Satisfaction with Fitness Facilities Among Military Members and their Families			5. FUNDING NUMBERS F49620-93-1-0586 AFOSR CFDA #12.800			
6. AUTHOR(S) Lee Harrison, Mark A. Brennan, and Cynthia M. Shilanskis						
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Military Family Institute Marywood University 2300 Adams Avenue Scranton, PA 18509-1598			8. PERFORMING ORGANIZATION REPORT NUMBER Military Family Institute (MFI) Technical Report 98-3			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) AFOSR/NL 110 Duncan Avenue, Suite B115 Bolling AFB, DC 20332-0001			10. SPONSORING/MONITORING AGENCY REPORT NUMBER AFOSR/NL Project Task #7755/00			
11. SUPPLEMENTARY NOTES Contracting officer: Ms. Marilyn J. McKee						
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited.			12b. DISTRIBUTION CODE			
13. ABSTRACT (Maximum 200 words): The purpose of this study was to obtain baseline data on the physical activity levels, preferences and intensity of Armed Forces members, their spouses and their families. It also collected a variety of data related to satisfaction with fitness facilities and programs. Among the areas of interest explored were specific activities and location of where these were performed, intensity and frequency of exercise, and identification of favorite and least favorite programs/facilities. All military members were compared on the basis of duty location, gender, rank, and service. Military spouses were compared by service and gender. Finally, military children were compared by gender, service, and academic grade.						
14. SUBJECT TERMS physical activity physical fitness fitness facilities exercise fitness facility usage					15. NUMBER OF PAGES 310	
					16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified		18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified		19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified		20. LIMITATION OF ABSTRACT Unlimited